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SETTING THE STANDARD

# What MSX?

Summer 1985

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**DO YOU NEED A MICRO? — 20 reasons why**

**BUYERS GUIDE: ALL SOFTWARE AND HARDWARE**

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# What MSX?

Summer 1985 Volume 1 Number 2

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## NEWS



## COMPETITION



## ON TRIAL

Four brand new MSX micros get the test treatment and we've been playing the best games too.



## GROUP TESTS



## MSX WORLD



## STARTING OUT



## BUYERS GUIDE




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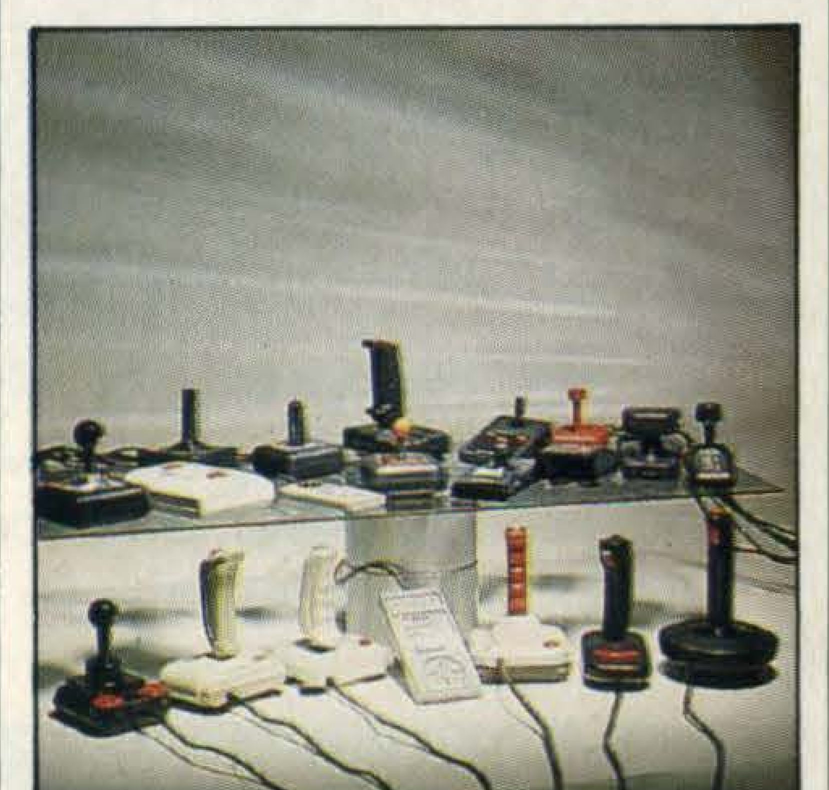

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# LOW END MSX PRICES TUMBLE

Price cuts and budget computers have heralded a boom at the lower end of the MSX market. That is against the background of a falling pound that should be making imported products more expensive.

First below the £200 barrier was Goldstar, with their 64K MSX computer reviewed in this issue. Toshiba weren't long in responding, cutting the price of the HX-10 by £40 to £239.95, and throwing in a package of games software worth over £21. The games are Manic Miner, Hunchback and French Is Fun. The HX-10 is being discounted even more in some outlets.

Mitsubishi chose the free software approach in a bid to offer better value for money. Buy the ML-F48 or ML-F80 computer and you'll be given a six pack of games software worth over £45. With the 32K MLF-48 costing just £225, it is a tempting offer.

Soon to arrive is another Korean-made machine, the Network NW200, with a sub-£200 price. And David Crosweller, PR man for Goldstar, claims that £150 MSX micros are not only possible but likely in the near future. With other non-MSX companies engaged in a vicious price war that is causing casualties galore, and a pound that will hopefully regain some ground, lower priced MSX micros are looking ever more certain.




# MSX PLUS FROM TOSHIBA

Toshiba have been showing their next MSX micro to the trade in Japan and the US. Called the HX-22, it is radically different from the HX-10 on the specifications front.

The main feature is an extra area of memory that can be used to store up to 16 programs, as if they were stored on a disk drive. It is what is called a RAM disk. The programs are loaded up from tape or disk and can then be loaded very rapidly into the main RAM using BASIC commands. The RAM disk stores 32K of program or data, and can be treated just like an external disk drive. You can use it to store data to be output to a printer, so the computer can carry on computing while things are being printed out.

Other specifications include a two way RS-232C interface, so one MSX micro can 'talk' to another and a built-in word processing package. As this last item is for the Japanese market, it won't be on any export versions of the HX-22 and will probably be replaced by another business-type program.

The HX-22 will cost more than current MSX micros, but actual prices and delivery dates aren't known yet.

# MSX GOES ARABIC

MSX is reaching the Arab world thanks to a tie-up between Microsoft and a Kuwaiti company called Alalamiah Software. The result is Arabic/English MSX computers and Arabic software.

Two manufacturers are making Arabic versions of their computers. They are Hitachi and Yamaha. The changes made include a full Arabic character set and right to left cursor movement. Keys are marked with Arabic and English characters.

Software to be launched with the computers includes programs, such as Arab/English tutors, Koran quizzes and Arabic design programs. Alalamiah hope to launch around five new titles a month.

Typical of the new computers is the Yamaha AX-100, based on the CX-5M. It costs £300 and has none of the musical features of the CX-5M. It does have a text writer program and another to convert Islam and Gregorian calendars.

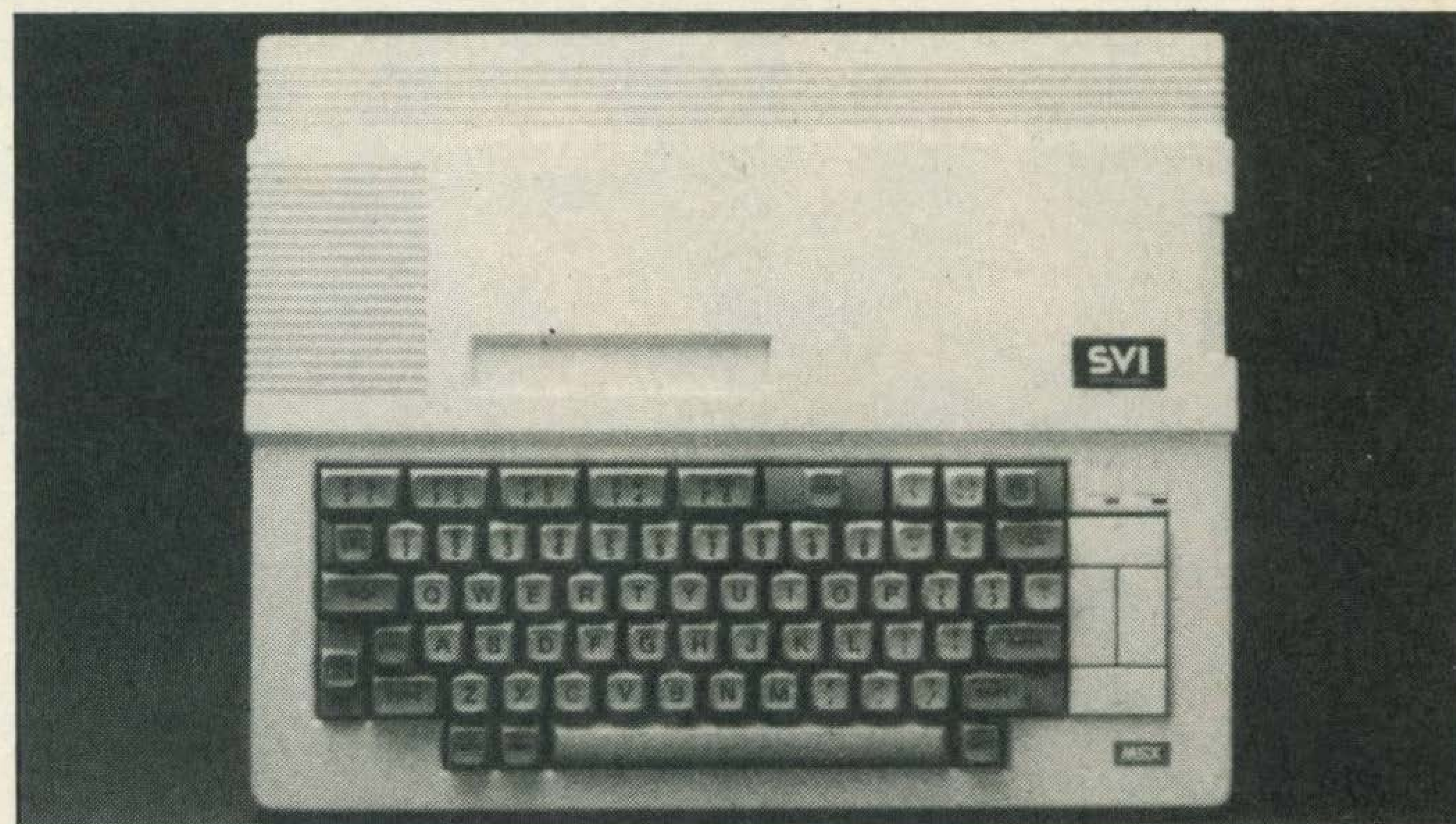
Future Alalamiah plans include an Arabic Disk Operating System and Arabic printers.




# BUILT IN DISK FROM SPECTRAVIDEO

At a recent American trade show Spectravideo displayed their next computer, called the Express. Its most interesting feature was a built-in 3.5in disk drive.

Inside there will be 64K RAM and 16K VRAM. The keyboard features 73 keys and a cursor keypad. A retractable handle is found on the back of the casing, and literature claimed that a carrying case would be supplied. Interfaces include RS-232C and Centronics ports, two joystick ports and two I/O ports. The brochure claimed that built-in software would include a memo writer, spreadsheet, report writer and file handler. The disk drive will allow MSX-DOS, Disk BASIC and CP/M software to be run.




Spectravideo were also showing a network interface that allows 32 machines to be connected together, sharing a ten Megabyte hard disk storage device. There's an MSX style data recorder (the SVI-767) and an MSX version of the Quickshot 2 joystick.

The new computer is still some months away, and will probably be launched in the Autumn.

# TAKE FIVE RECORDERS




Computer dedicated data recorders are much more efficient at loading and saving cassette based computer programs than audio cassette recorders and five new models have recently come onto the market.

A German data recorder, currently distributed by Twillstar Computers retails at £25.95 but doesn't include the MSX cassette cable at £3.95 and the power supply unit costing £4.95. LED lights display "Ready", "Save", "Load" and "Control" functions and it has an automatic level control and shut off.

Binatone's data recorder costs £29.95 and includes an optimised Load-Save circuitry, cue/review facility and a tape counter for program indexing. A high pitched tone can be heard while a program is being saved. The price includes the MSX cassette cable.

Spectravideo's SVI-767 data recorder costs £29.95 and includes the MSX cassette cable.

Network and Micro Dealer's data recorders, both have inbuilt audio speakers and are not exclusively dedicated to computer use.

The NW900 from Network costs £29.95 including the MSX cassette cable and Micro Dealer's Omega Compurecorder is priced at £24.95 together with a head alignment tape but not an MSX cassette cable. That may come with your computer.

# JOYSTICKS REVAMPED

Joysticks of all shapes and sizes were launched at the L.E.T trade show in February.

Spectravideo added two more joysticks to their Quickshot range, the cream-coloured Quickshot II and the black Quickshot V at £14.95 and £11.95 respectively. Both have two fire buttons on the handle and the latter sports a large keypad on the base.

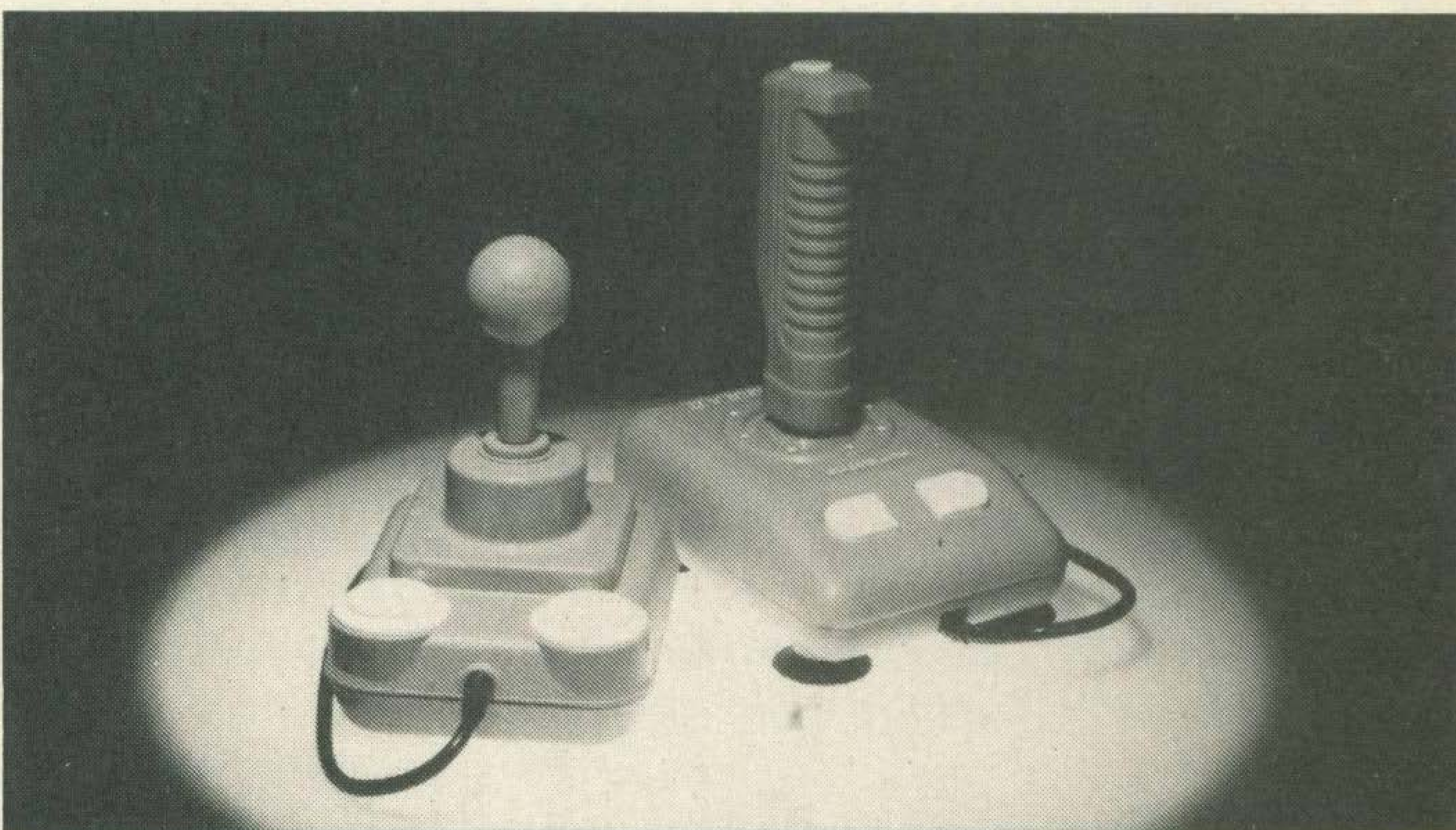
Both joysticks have an automatic fast firing function as well as a twin fire action enabling the user to use the handle's two fire buttons to control two different actions on screen. This function won't work unless software has been written to utilise it. Software manufacturers take note!

Kempston Micro Electronics have renamed and revamped two of their joysticks; the Competition Pro 5000 and 3000 are now called the Formula 1 and 2 at £16.95 and £11.95 respectively. These and the Scoreboard Joystick, a box-like device with two fire buttons at £28.95 are now part of their new Grand Prix range.

Changes include the colour — now blue and the addition of micro switches which Kempston claim endow the controllers with more precise and positive actions.

Voltmace have at last added a MSX compatible version to their joystick range, the Delta 3SM. Retailing at £11.95, it has three red fire buttons.

The Powerplay joystick from Protek Computing is their latest addition to their range of computer peripherals and costs £11.95. It has three red fire buttons and a rapid fire function. Finally, Vulcan Electronics have launched an MSX joystick costing £13.



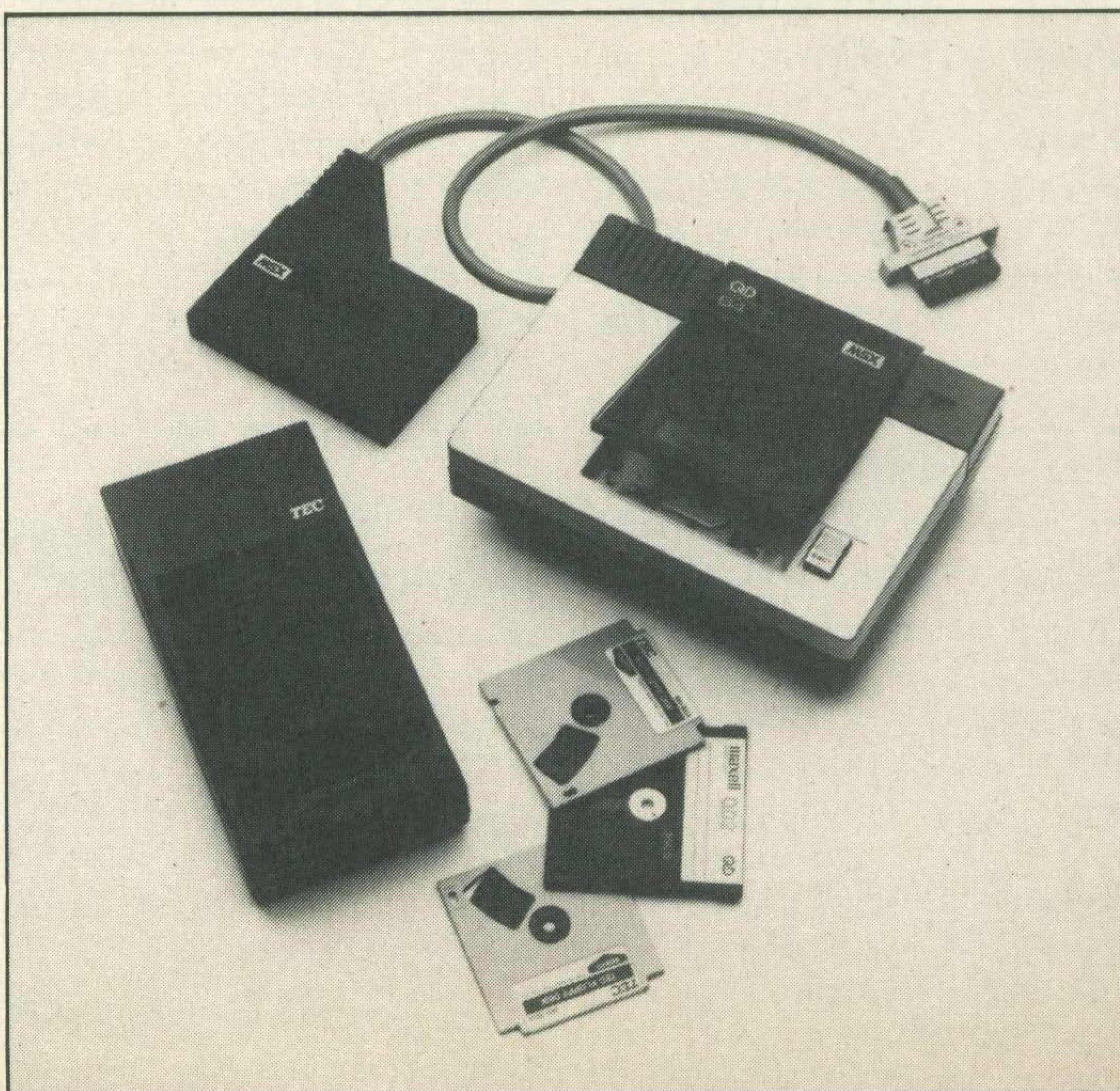
# LOW COST DISK DRIVE DEVELOPMENTS

Disk drives are the most efficient means of saving and loading data and MSX is designed to support a disk drive system.

All information is loaded onto magnetic disks and these are able to store much more data than either cassette tapes or ROM cartridges. At present there are four MSX compatible disk drives available, but only two, the Sony HBD-50 and the Spectravideo SVI-707, will randomly access files at any position on disk.

The other two use sequential access systems which means that they run through the track sectors until they reach the relevant file.

Sony's disk drive uses 3.5 inch disks and offers 360K of usable memory for a £350 price tag. It connects to the micro via the cartridge port. It will run MSX-DOS when the disk version becomes available and is supplied with DISK BASIC.




Spectravideo's disk drive uses 5.25 inch double-sided double density disks and offers 326K of memory for £345.

The Tiny disk drive, the MC 132 designed by the Japanese company TE and distributed by Cambridge Micro Computer Centre provides just 32k of unformatted memory for a much lower £40. It uses a sequential access system and small 2.5 inch disks.

Microlink's Quick disk drive costs about £130 and holds 128K unformatted memory. It uses double-sided double density 2.8 inch disks and like the Tiny disk drive has a sequential access system.

# What's this woman doing?



Several years ago, I was a university teacher. One evening my wife and I were visiting a group of college friends. One of them began discussing a very simple small business that a person can start at home – a "home money project", as he called it. But when he told me how much money it brought in, I almost dropped my coffee cup on my lap.

My wife and I discussed the project as we were driving home. We decided to try it.

The project kept us busy about 8-9 hours each week. We used our dining room as an office and kept supplies in one corner of our hall cupboard.

At first our income was small – £75 to £95 per week. But, as the months passed, our "kitchen table" income climbed to over £680 per week.

Let me emphasize one thing. This is very important. Our "money project" is moral, honest and downright enjoyable. And, it's 100% your own. It doesn't involve working for anyone else.

I explained the project to my mother. She was 71 years old and lived by herself in a flat on West Market Street. Within the first 90 days she made over £3,000. All by herself!

As our curiosity grew, we discovered a variety of other people making money but with somewhat different projects...

I talked with a housewife who's been earning thousands of pounds for over six years. She uses one corner of her garage as a work area.

- She makes up to £200 per week in her spare time.
- She provides a needed service to her community.
- She works exclusively at home...using a card table. She doesn't need a special office of any kind.
- She works for no one else. There is no selling involved. Most of her clients call her at home. In fact, she installed a phone in the garage.

## TRY THIS TEST

1. When your Guide arrives, select one project. Read the directions carefully. Remember to begin slowly.
2. Try it for six months.
3. At the end of this trial period, examine your income. If you're not satisfied with the results, return the Guide and we will REFUND YOUR FULL PURCHASE PRICE...NO CONDITIONS... NO DELAYS.

- Her service is so simple that almost anyone with a flair for crafts could start the same business in their own neighbourhood within 20 days. The photo above shows her busy with one of her craft projects *(full details are given to you)*.

## OVER £35,000 PER YEAR

Two housewives I spoke with started a similar project two years ago. Both of them have young children at home and households to run – in addition to their home-based business. Currently, their part-time project is bringing in over £35,000 a year.

Another couple using the same project we used made £14,870 in just five months.

Obviously, this is exceptional income. What you make will be up to you. But the income potential from some of these projects can be staggering. A husband and wife team I spoke with started a money project similar to ours. Last year, operating full time, they earned over £108,000 – all at home on their farm.

## HOW TO START

First, you must be willing to work. All of these projects require time, energy and creativity.

Second, you'll need some working space in your home or flat. A telephone will help, too.

Third, our projects are tested and workable. No envelope stuffing schemes, no "party plans", no door-to-door selling. None of that nonsense.

You won't need "capital" to begin. Many of the projects can be started for as little as £25 to £50.

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Quite frankly, we're happy to share them with you. Because they involve creative projects that can be duplicated in thousands of neighbourhoods all over the country. The opportunity is nationwide. We won't be competing with you and you won't be competing with us. That's why we've put everything in a simple, easy-to-follow Starter Guide. It shows you step by step how to begin each project.

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## SOFTWARE ON SHOW

MSX software made the biggest impact at an otherwise unexciting L.E.T show in February. Very few new products or software ideas were in evidence apart from the wide variety of MSX products.

Many software houses have converted one or two of their best selling games for the MSX, but they are loath to start producing more titles because of the difficulty in finding dealers willing to take them.

An Ocean Software spokesman told us that although they were including their game Decathlon in the software package accompanying Toshiba's computer, they had no intention of trying to sell it separately. 'It just wouldn't sell' he said. Artic Computing have converted their best seller, Mutant Monty for MSX, but will only make it to order. Melbourne House are waiting to see how their new conversion, The Hobbit, priced at £14.95 does before converting Mugsy or Classic Adventure.

Clive Bailey of Beyond told us that they would be waiting to see how the demand for MSX games went before producing anything — a comment we heard several times before leaving the show!

Fortunately not everyone shared their pessimism. Some of the companies at the show were so confident of MSX products that they were selling nothing else — Electric Software, Konami and Aackosoft International, a Dutch company, for example. Electric were demonstrating a number of games including their newest two, Le Mans, a racing car simulator and The Wreck, a graphics adventure, both at £9.95. Zaxxon and Buck Rodgers each costing £11.95 will be available this month. Electric also have plans to import two Japanese games called Chack'n Pop and Ferq. A number of professional MSX DOS games are in the pipeline.

Aackosoft showed us the Aackotext and the Aackobase, a word processor and data base which can be linked together, costing about £45 each for both a disk and cassette. Games include Alpha Blaster, Scramble, Jet Fighter, Space Busters and Jet Bomber retailing at about £9.




Another vote of confidence for MSX products comes from Europe where the MSX computers have really taken off. Without exception, all the software houses told us that European dealers had expressed great interest in MSX games because the MSX computers are selling like hot cakes. Mike Hall of Electric Software told us that Philips had imported 40,000 of their computers into Italy and had quickly sold every one — surprising because there was very little MSX software there!

Despite a hint of pessimism from some of the software houses we discovered that many of them were planning to produce cassette-based games. Alligata are bringing out Superbowl, an American football simulation in May for £7.95. A.S.K are selling Number Chaser, an educational game utilising mental arithmetic skills for 5 to 14 year olds, retailing at £8.95.

Bubble Bus have used a Bridge Grand Master to write Boardello, a type of Othello for £7.95. CDS Microsystems are currently developing Steve Davis Snooker and will be doing a Pool version for the European market. They're also bringing out Castle Blackstar, part of a trilogy for £6.95. DK'Tronics are planning to release two games costing £9.95 each this month —Pop Eye and Minder, described by Roger Barnard, a DK'Tronic spokesman as 'a different experience altogether' (we wait with bated breath!).

Icon Software are scheduled to release their four MSX games over the next couple of months and Chyralis is the first. Following on will be Frankenstein, Cave Man Capers and Phantom Zone. They'll all retail at £6.95.

Level 9 Computing's latest adventure is Emerald Isle which follows your efforts to get off an island in the Bermuda Triangle, priced at £6.95. Mastertronic's new £1.99 game is Splash and should be available this month. Mirrorsoft's conversion of Games Creator, out this month will cost £12.95. Mr Micro were demonstrating their two new games, Mayhem and Zakil Wood, a graphics adventure, for £7.95 each.

Quicksilva plans to launch four program conversions; Ant Attack, Fred and Sprite Editor for £7.95 each and Games Designer at £9.95.

Maths Invaders, an educational maths game for 4 to 12 year olds from Stell Software retails at £7.95. Finally, Terminal Software previewed their first MSX game, Lazy Jones costing £8.95.

All this software activity from both new and established companies is surely a healthy sign for increasing interest and confidence in MSX.

## PRINT OUT

Books for the MSX owner continue to be announced and released. Melbourne House have issued their third MSX book, 'MSX Exposed' by Joe Pritchard. Priced at £7.95, it is a beginners introduction to programming, leading up to an introduction to Machine Code.

Collins have two MSX titles in the shops. 'Working With MSX BASIC' costs £7.95 and is by the prolific author Ian Sinclair, and is a guide to programming MSX micros. 'MSX Games Book' is the second title, and it is by Jim Gregory.

Out in May will be 'Very Basic BASIC' by Derek Ekkershaw and Peter Schofield, from Century Communications. Costing just £2.95, the blurb claims it will guide the first time MSX user through the first few weeks of programming.

## ZOB STORY

Collect all 16 fragments of the armour of Zob while fighting off over 86 monsters, to complete PSS's new adventure game, Sword and Sorcery costing £10.

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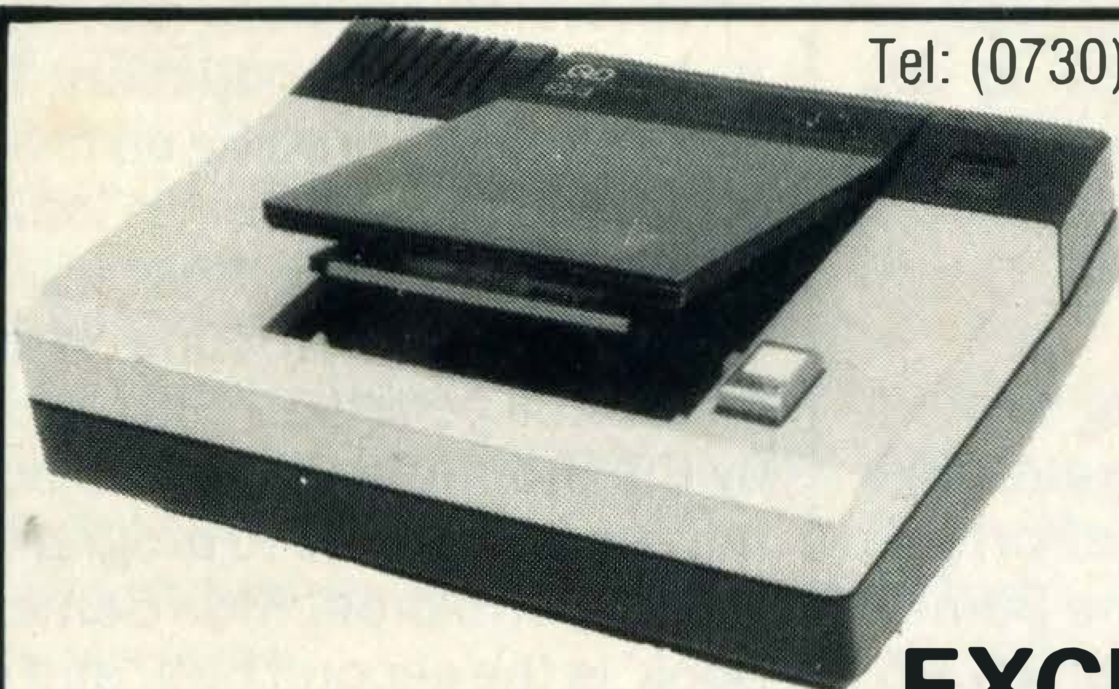
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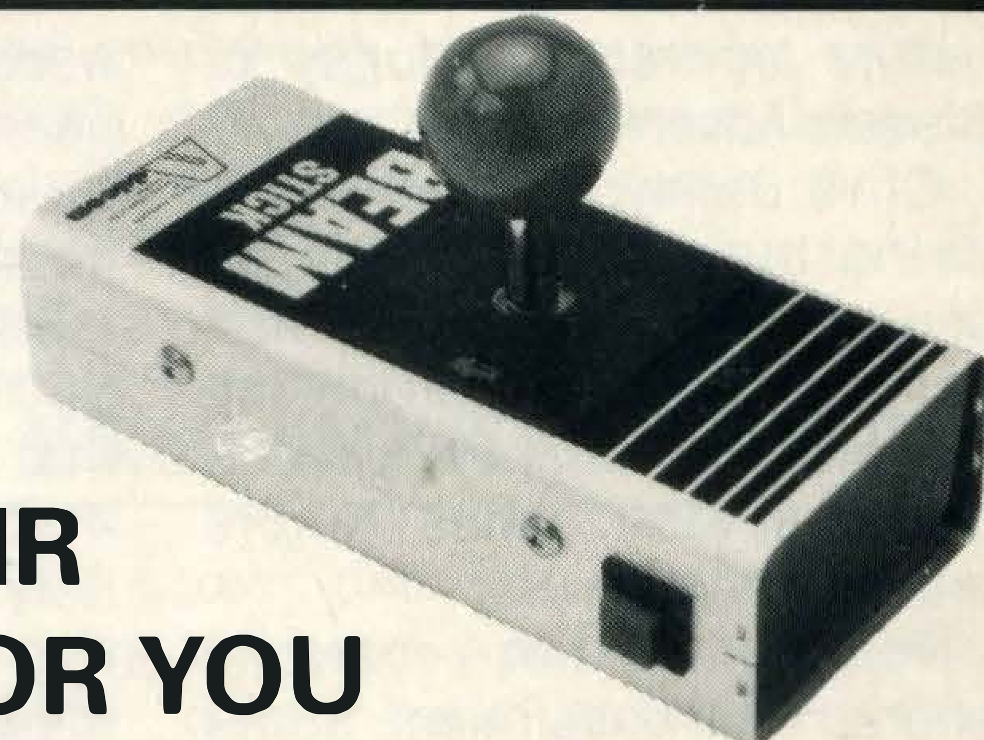
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# WHY BUY A MICRO?

## Thinking of buying a computer? Here are twenty reasons why you should

**Talk to a computer buff and you'll wonder how man survived before the dawn of computers. History is divided into years P.C. (Pre Computer) and years A.C. (After Clive). Those who don't agree with this apparently suffer from a Luddite mentality. This view is hopelessly at odds with the view of the person who's yet to fall prey to the attractions of the microchip and who sees the whole phenomenon as a case of technology gone mad.**

Between these two schools lie you, wondering whether to take the plunge and buy a computer. £300 or so is a tidy sum to spend on a whim. The family may not appreciate the fortnight in Spain being sacrificed for a glorified calculator.

What can a computer do? What can you do with a computer? Can you do without a computer? It is worth spending a little time deciding if and why you need a computer.

At the end of this article there is a chart to fill in. It will focus your thoughts and help you decide if you need a computer or not. It should also help you to plan your computing purchases in order to get exactly what you need for a particular purpose. Consider it a profile of your computing requirements.

If you haven't really thought seriously about what you can use a computer for, you have one reason staring you in the face. Curiosity is perhaps the best name for it. No matter how rationally you debate the pros and cons of using a computer for different applications, in the final analysis, there is no better proof than hands on experience. All the debate in the world can't equal practical experimentation. And, once you have a computer, new applications will almost certainly spring to mind, with you in the ideal position to try them out.

Unfortunately, buying a computer is an expensive way to answer the question "What if?" If the answer turns out to be that you really don't need a computer after all, you've wasted good money. Ideally, it would be great to hire a computer for a short period to find out what they are like. That's not often possible, so you'll need to evaluate diffe-



rent applications in your head.

Games are the obvious application. If you have ever felt attracted to amusement arcades, you'll know the adrenalin-activating properties of a good arcade game. Unfortunately, at 20p a go, mastering the games in an arcade environment is costly. Buying a computer gives you the chance to try arcade favourites in the comfort of your own home, and at a cost of just a few pounds for as many attempts as you want. You won't have the eyes of the world on you, and will be able to play as and when the urge takes you.

Of course there is an alternative to the computer, in the shape of the once popular video games machines. These are now in attics across the land, replaced by the computer. Games are still available but the choice is limited and cartridges are expensive. MSX computers take cartridges, so if you want the best quality games and instant loading, you have that option available.

Alternatively, pocket versions of arcade games, using liquid crystal displays, are available for £20 or so. Once you've got the knack of a particular game, these toys are precious little use.

The other option is not to play arcade games at all — a difficult decision to stick to. With all the games available, you're bound to find something that gives you an itchy trigger finger.

Arcade games aren't the only sort. If you feel your reflexes are too slow to survive a planetary invasion, adventure games offer a more cerebral form of entertainment, and certainly aren't imitated in amusement arcades.

You'll be plunged into an imaginary world, having to survive on your wits and intelligence. There may be monsters to do battle with, treasure to collect and plenty to keep you amused over long winter evenings. The non-computer alternative to this type of game is the printed adventure game book. Written in sections, your decisions lead you to one section after another, trying to solve the adventure. Such books are inexpensive, widely available, portable (unlike MSX computers), but once mastered, not much use. If you've never been adventuring before, they are worth trying out to see if you like the genre of game.

Adventure and arcade games are a world apart from traditional parlour and pub games. Fear not — these too are available for computers. Whether your preference is for bridge, chess, cribbage or backgammon, you'll probably find a program that lets you play against your computer. Computers make mean opponents and such games give ample opportunity to brush up on your skills, providing you can accept being beaten by a machine. The other advantage is that you can play if no-one around wants to or is able to.

The alternative is to buy the cards, pieces or board needed for a game. Many people find it decidedly odd playing a game like chess on a television screen. However, buying the bits doesn't guarantee opponents, nor will you learn a good game unless you find a good teacher. Chess machines do exist, combining a real board with a computer program, but the best of these cost as much as a budget MSX computer.

That's nothing compared to the cost of trying out a flight simulator or taking driving lessons in a Formula One racing car. Countless computers have been sold to enthusiasts wanting to fly or race without leaving the living room. With a computer and a program you can pilot a Boeing 737, fly the space shuttle, race around Silverstone, command a submarine and much, much more. The only alternative is perhaps a racing car simulator in an amusement arcade, but this is costly and not as convenient as a computer simulation.

Simulators also provide useful practice if you want to learn to fly or to drive. Most are pretty realistic and it won't matter how many times you crash.

Computers make excellent teachers of other subjects too. They have infinite patience, always teach at your own pace and to learn a new subject, all you need is a new program. The range of subjects you can learn with a computer is limited only by the imagination of programmers. Science, history, literature and maths programs are all available. A small library of






programs can replace a large library of books.

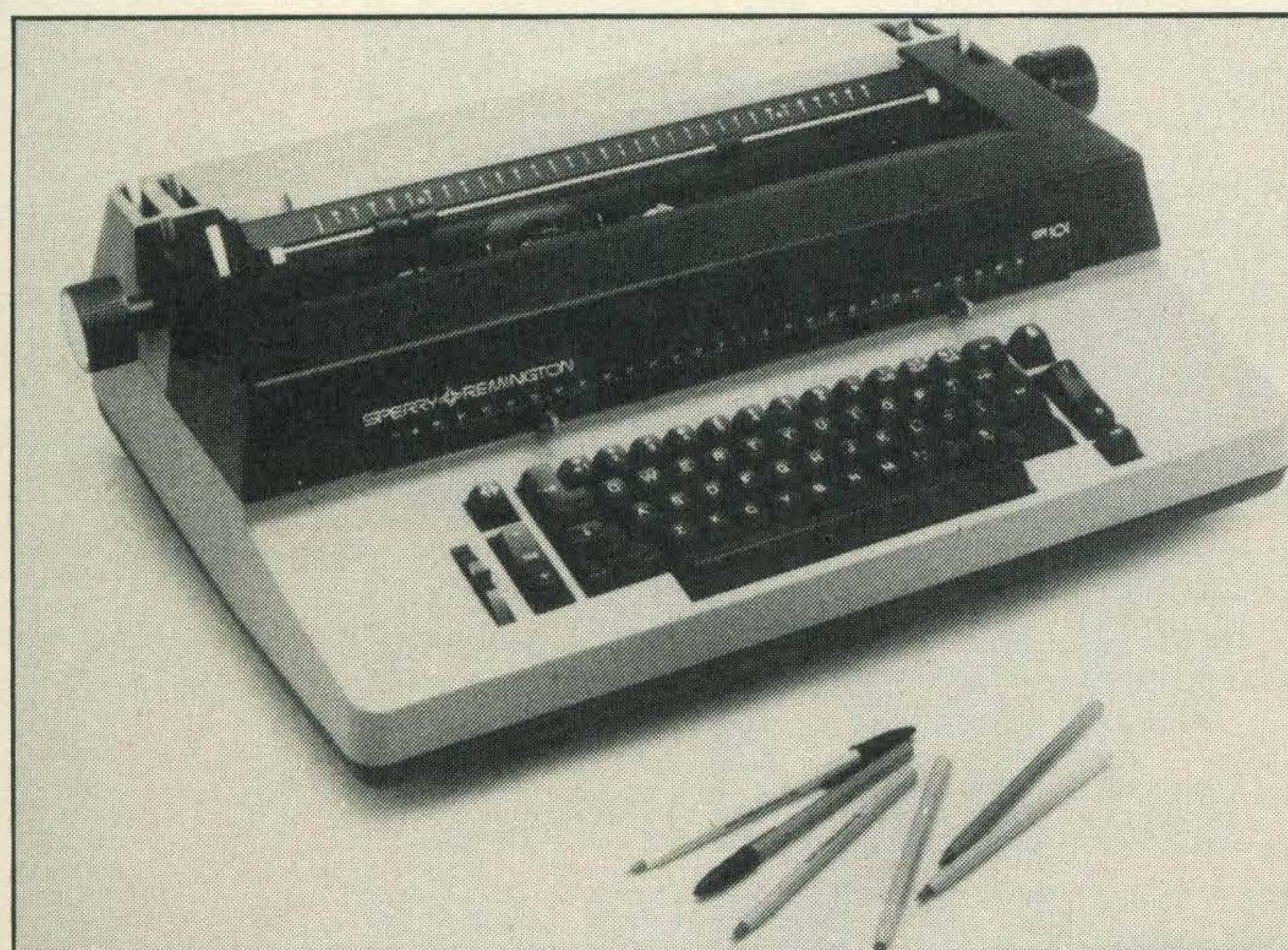
If you are travelling to a foreign land, you could get a language program to teach you the native lingo. Compared to the cost of a proper language course, a computer is quite reasonably priced.

You'll find programs that teach you about computer languages too. BASIC is the obvious language to learn, though at a more advanced stage, you may want to learn Machine Code. One program could do the job of many books, and probably teach you more too.

Learning about computers is yet another reason to buy a computer. Books teach just so much — at some point you'll have to get your hands on a machine.

You may wonder why there is any need to learn about computers in the first place. Computeracy is not yet essential to survival in the modern world, but all the signs are that computers are going to play a more and more important role in our lives. Those who know about computers will be better placed to take advantage of the changes happening around them, when it comes to









A video games machine gives games entertainment, but that's all. Computers can play more traditional games too, with only one person. Your computer could do the job of a typewriter, with a word processing program, or replace a cardbox, or act as a directory, with the right software. All you have to do is add programs and peripherals

work habits, home conveniences and so on. Training on computers is training for the future.

Children already learn a good deal about computers at school. Having a computer in the home is a way for parents to keep up with the young ones (or at least not be so far behind), and for the children to practise what they are taught. You don't need to have the same computer as the one at school — so long as your computer has a good BASIC, as MSX computers do, and a good range of software available.

Given you have a computer, you can choose from the multitude of educational programs available for children of all ages. Maths and spelling programs are the most common, though there are many revision programs available for advanced 'A' and 'O' level subjects. If you don't understand the subjects your children are studying, leave it to a program and a computer to help them.

For mathematical applications, whether in a homework context or for scientific purposes, the computer is a natural. It works faster than a pocket calculator, can have very complex calculations programmed in and can of course be connected to a printer for hard copy of results. You could buy a programmable scientific calculator, which is much more portable than a computer, but the best of these cost £100 or more, still need programming and do nothing more than calculate. If you want to tackle serious scientific calculations, a computer is the answer.

Computers come in handy for hobbies too. Astronomers or astrologers could use the calculation facilities. Electricians could write programs to test circuit designs. War games enthusiasts could program the calculations they need into a computer. Gamblers could work out odds. When you have a computer, it is amazing what uses you can dream up.

Data storage is an established application. With a database program you can store all manner of information. It could be a catalogue of records or books. It could be details of a stamp or butterfly collection. It could be a directory of friends' addresses and telephone numbers.

Cynics say that electronic storage of data is merely an expensive way of replacing files or address books. To store data, you have to plan a system and enter all the information. In many cases, the old paper and card methods are cheaper, more accessible and easier to use. Still, if you have a great deal of data that may need to be manipulated, a computer can be a very efficient filing system.

In the home, a computer can do much more than just store an address book. It should be possible, and companies like Sony have demonstrated that it is possible, to control many things in a house. A computer could control the central heating, monitor power consumption, set the video or burglar alarms — just plug in and program the appliance. We have a way to go yet before such applications become widespread but computer buffs with a DIY bent are already tackling such projects. Control of the home is a futuristic reason for buying a computer but a reason nonetheless.

On a more practical level, a computer in the home can be used to run accounts and budgeting software to keep a track of finances. It could store family trees, and with connections to electronic databases, it could be used for electronic shopping. In a sense it is just replacing paper, but only a computer nut would claim that computers are the answer to everything. What they do do is produce more reliable systems that are stepping stones to the future.

Electronic mail is one feature of the future that is very much today. With a modem you can link into electronic mailbox networks and communicate with other computer users, swapping tips, chatting, leaving messages and so on. You can access databases to get latest news, travel reports, financial information and so on. Electronic communications is a booming industry and one you can join right now.

Accounts may suggest business applications. It is a common fallacy that a home micro can run a large business. A



standard MSX machine with financial and word processor programs, a disk drive and printer should be able to handle the accounts, data and documentation of a very small company or a home business. For larger companies, you really want to be considering an office micro, costing £1000 or more.

One huge advantage of MSX computers is that they can run CP/M business programs from the office micro, if an MSX disk drive is fitted. This means that you could bring work home from the office, plug in your MSX micro and carry on computing. Certainly business applications make a good reason to buy a computer for the home. The alternative is either hiring accountants or sticking with reams of paperwork.

The mention of word processing will cause many eyebrows to raise. It is becoming acknowledged as a most important computer application. In the business environment, this is certainly the case, but in the home, the use may be more limited. It depends on how much correspondence you have. If you already have a reasonable typewriter, a computer for word processing may be overkill, as you'll need to buy a printer too. But if you are a budding novelist or do plenty of correspondence that must look good, a computer is much cheaper than hiring a typist.




Writing need not be restricted to letters and books. There are many, many people who have made money out of computers by writing programs. That needs a computer and some knowledge of programming, but a computer is the first step. Buy a computer, master programming skills, come up with an original idea and you could have a best seller on your hands. In the early days of MSX you'll have more chance of finding a market too. As an alternative to programs you might also consider books or magazine articles. Both are lucrative fields. With the right breaks, you'll find computing is one hobby that can pay for itself.

If you start to investigate programming you'll almost certainly come to know the graphics potential of MSX computers. Many computer buffs use their machines almost solely for graphics purposes. Design studios experiment with Computer Aided Design (CAD). Other hobbyists connect cameras to their computers and generate computer images of their subjects. It is relatively easy to write simple programs that use mathematical relationships to generate beautiful patterns on screen or on paper. Computer graphics is a field that is fascinating, satisfying to the creative instinct and fertile ground for experimentation.

Much the same can be said about computer music. MSX computers have a sound chip that is capable of some stunning effects. You can write you own tunes or load programs that turn your computer into a miniature synthesizer. Yamaha's MSX computer comes with a proper piano-style keyboard and outplays many synthesizers costing much more. It is good enough to be used on stage.

Buying a proper musical instrument or synthesizer is an alternative. If music is your only interest, then a kosher instrument will be more satisfying than a programmed computer. But, if music is just one of many interests, the answer may be different.

Computers could be justified in the interests of family goodwill too. Having a computer in the house will give bored children someting to amuse themselves with. The family that plays together stays together. Beware of the dangers of getting so involved with your new toy that you shut yourself away from the family though. It is all too easy to become totally absorbed in games or programming, to the exclusion of other commitments.

Owning a computer will probably not transform your life immediately. But if you add up all the things you could do with it, you'll probably see that what a computer makes possible is more than enough to justify the expense. If you consider the cost of all the alternatives you'll need to do the same as you can with a computer, you'll realize that a computer is excellent value for money. So, fill in the chart, see what your need rating is and we hope you'll shortly be a paid up member of the computing fraternity. What's more, we hope you'll be a member of the MSX computing fraternity. ■

## Do you really need a computer? Fill in and find out

| Reason | No Way | Couldn't Care | Give It A Go | Definitely Interested | Essential |
|---|---|---|---|---|---|
| Learn about computers | | | | | |
| Play arcade games | | | | | |
| Help with hobbies | | | | | |
| Word processing | | | | | |
| Join computer networks | | | | | |
| Manage home finances | | | | | |
| Make music | | | | | |
| Make money | | | | | |
| Play adventure games | | | | | |
| Keep the kids amused | | | | | |
| Do scientific calculations | | | | | |
| Use simulators | | | | | |
| Organize data | | | | | |
| Curiosity | | | | | |
| Play strategy games | | | | | |
| Control the home | | | | | |
| Education | | | | | |
| Everyone else has one | | | | | |
| Run a small business | | | | | |
| Explore computer graphics | | | | | |
| | 1 point | 2 points | 3 points | 4 points | 5 points |

Total up your points for your answers:

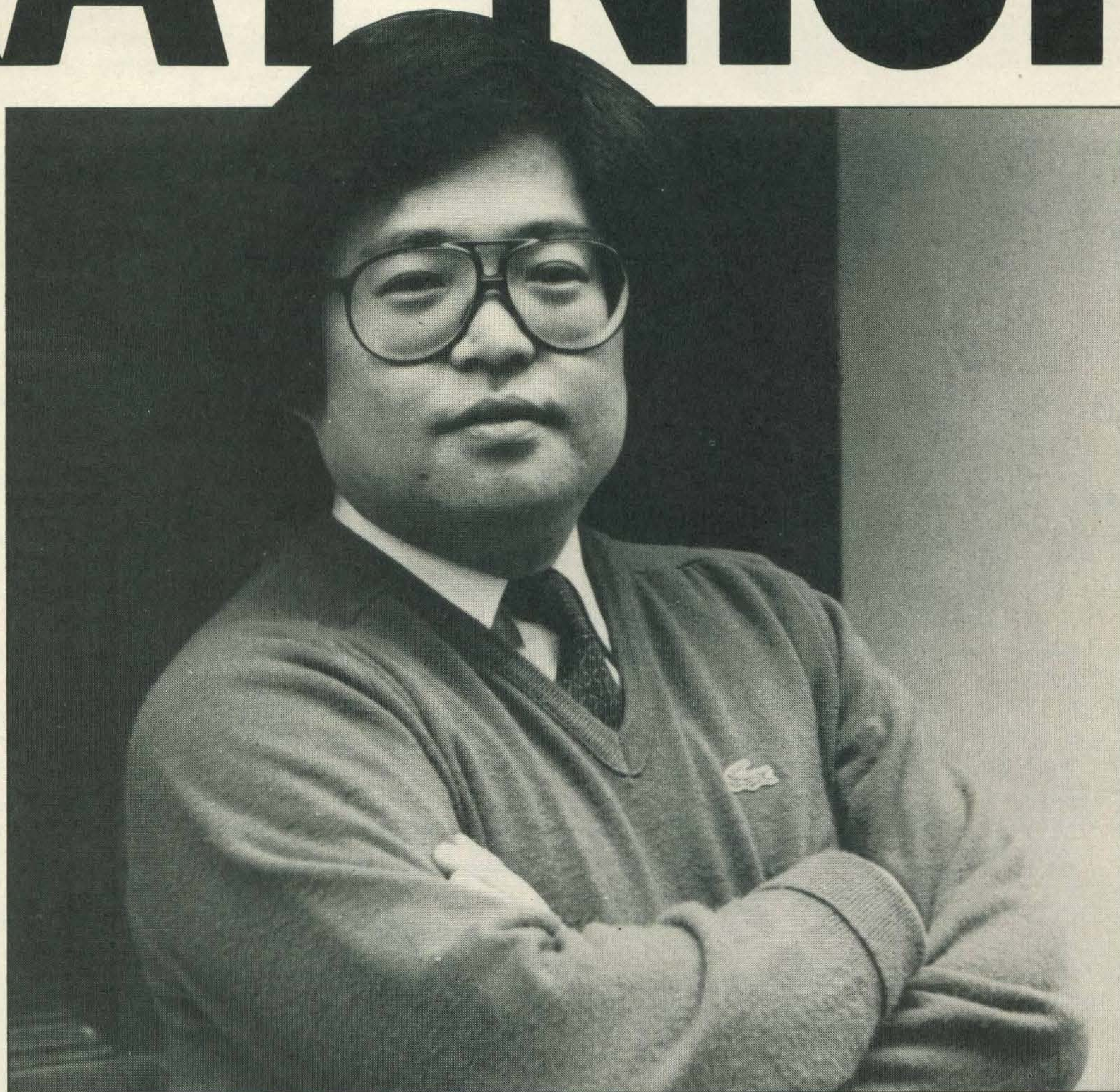
20-40 Stick to a slide rule

40-60 Discuss it with the family

60-80 Discuss it with a dealer

80 plus what are you waiting for?

# KAY NISHI



# THE MAN BEHIND MSX

**MSX exists largely due to the efforts of one man – Kay Nishi. We've been talking to him about the MSX phenomena**

**Kay Nishi is a difficult man to get in touch with. He almost lives aboard a Jumbo jet and even his secretary has a hard time keeping track of his movements. Still, as the man who most deserves the title Mr MSX, you can understand why he is so frantically busy.**

When I eventually got to talk to him, after an exchange of at least a dozen Telexes, it was 1.15a.m. in Tokyo, a time when most of us would rather be tucked up in bed. Not Kay Nishi. He was still living and breathing MSX with incredible enthusiasm.

Kazuhiro Nishi has been into computers from their very earliest days. Based on a small computer magazine called ASCII, he founded a company of the same name. In 1978, following an agreement with Microsoft in America, ASCII Microsoft Ltd. was established, to market American software and Microsoft BASIC in the Far East

Then along came Spectravideo, wanting to build a home micro in Hong Kong. ASCII



Microsoft agreed to supply the BASIC and developed what was almost MSX BASIC. Kay saw his chance. He had an excellent BASIC, he was in the heart of the Japanese multi-nationals, and he began to spread the idea of a standard in home computing. The big companies jumped at the chance to get into home computers and the standard was announced in 1983. The rest is history.

Kay spends his time co-ordinating the development of MSX on a worldwide basis, flying from country to country selling the concept and spreading new ideas. He is the public face on what is becoming a phenomenon in the computer industry and thoroughly deserves to be called Mr MSX.

**How did you first get involved in computing?**

When I was nine or ten years old, some 20 years ago, my father brought home a programmable electronic machine. It triggered my interest. I was fascinated by the way it could handle numbers and wondered if it could handle text and graphics in the same manner. The potential uses of such a machine could be enormous.

At school I was an electronics whizz kid. I am into amateur radio astronomy (I once built my own telescope) and photography. So I became very involved with the early computers. Though I took a degree in mechanical engineering and robotics at college, most of my knowledge is self taught, and I knew the basics of electronics by the time I reached university.

Then, in 1975, General Instruments introduced a video games chip and at the same time Intel announced their 8080 processor. From then on I knew where my future lay, and you know the history of MSX.

**Would you describe yourself as a computing professional?**

I think I still have a hobbyist approach to computing. To me it is still great fun. I am also impressed by the theoretical beauty of the latest developments and the challenge of bridging the gap between the theory and its practical implementation is a real driving force.



**'When I was nine or ten years old, my father brought home a programmable electronic machine. It triggered my Interest'**

**Is MSX a real advance on current computers, or is standardization the important thing?**

Everyone thinks that standardization is achieved by the actions of some large, invisible body. Standardization is not as important as all that — it is the separation of software and hardware that is crucial.

Until MSX, the two have been closely related. By that I mean that software has been developed for a particular micro, and dependent on that micro.

The life of a micro is a chain of events. In the first year, hardware is designed. In the second year, it is built. In the third year, software is developed. In the fourth year, software and hardware sales are at much the same rate. In the fifth year, software sales dominate as the hardware starts to saturate the market. In the next year, hardware sales accelerate as the amount of software gives customer confidence, and on it goes. This linking of hardware and software is the total evil of this business.

If you look at consumer goods, you'll see a different situation. Take the record, audio tape, video and television markets. The hardware is manufactured and developed by major companies, irrespective of the software (records, cassettes, TV programs and so on) The hardware companies can devote their efforts to producing low cost, high quality hardware. The software companies can concentrate on producing better records, tapes or software.

Until now, software companies have had to co-operate closely with the hardware manufacturers. They have had keep one eye out for models being discontinued and have not been free to develop products independently of the hardware companies. With MSX, companies can now develop hardware or software without having to worry about what is happening in the other camp.

## Compatible

Take Sinclair for example. With the launch of the Spectrum, all those companies producing ZX81 software were caught out and made unhappy. So too was the consumer. If he or she wants to upgrade from say a Spectrum to a QL, all the existing software must be written off as it is not compatible.

So, compatability is important, but it is the independence of hardware and software that is the most crucial ingredient.

## MSX IN JAPAN

**MSX activity in Japan is well ahead of activity here, with more machines, software and peripherals available. Surveying the latest developments gives a good idea of what lies in store for us.**

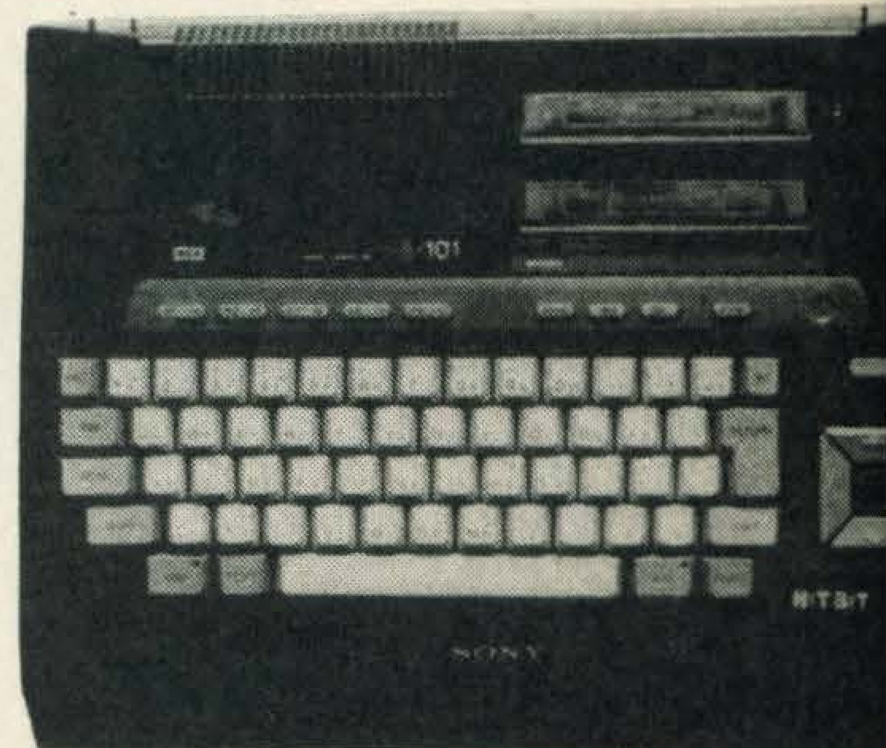
Budget MSX computers are a reality. Casio have an 8K micro selling for just over £100. It has rubberised keys, two buttons for Track and Field type games, cursor keys and a cursor keypad. An expansion unit, for around £50, gives the ability to add extra RAM, up to 64k. Casio are also selling cartridge programs, including Circus Charlie and UFO.

Sony have a budget MSX machine, the £170 HitBit HB-101. It has just 16K of RAM, but features space age styling, a carrying handle, built-in joystick and a full complement of keys.

Sony also have announced plans for two new micros — the HB-701 and the HB-701FD. Both have keyboards linked to the main processing unit by a cable and the latter machine has built-in 3.5in disk drives.

Teleton have a 32K machine with a separate keyboard. Their monitor is also a TV, and has the computing unit built into the base.

Hitachi have built a stereo cassette recorder into their MB-H2 micro. It is a 64K model with 16K of built-in firmware. This gives the user a graphics program, a musical program, a program to scan the contents of cassettes and locate a particular program, plus a Machine Code utility for writing Machine Code programs. The MB-H2 also has an RGB output.



Sony's HB-101 is a budget 16K micro

Graphics are certainly big news, with a number of video imposition units becoming available. Sanyo's MPC-X device allows a resolution of 512 x 204 pixels, 512 colours and has an RGB output. The Pioneer PX7BX micro can be interfaced to Pioneer's laser disc player and laser disc controller to use the graphics from these devices. An extra 8K of ROM is used for P-BASIC, to control these devices.

Graphics imposition devices allow you to mix computer and video or TV graphics. You'll




National's CF2601 Superimposition unit typifies the new wave of peripherals

**Is the UK an important market, or is MSX more likely to succeed in Europe?**

The UK market is extremely important. Home computer penetration of the market is already very high, with a higher percentage of families owning computers than in perhaps any other country. It is a mature market, and our mission is very clearly to establish MSX in the UK, by giving consumers a production that can be totally satisfied with.

**Is MSX basically a beginner's micro, or an upgrade machine?**

It is both.With the least expensive machines, costing perhaps £100 or so, we will have a rival to the Sinclair Spectrum and other micros. Price is important to the beginner. Yet the upwardly compatible nature of MSX means that it will appeal to users seeking a more sophisticated machine that will grow with them.

**Is the future of the home computer mainly as a games machine, or are the serious applications more important?**

It is impossible to ignore the games market. Entertainment is a very important factor in the world of computing. But I see more serious applications as being the more important, particularly in the field of communications.

This falls into two categories — personal and mass communcations. Personal communications is the realm of electronic mail and person to person computer communication, via networks, bulletin boards and the like. Mass communications is for things like Ceefax, Prestel and other databases. It will be possible to transmit software via these means too, at a very reasonable cost. So, communications is an important facet of home computing.

'I still have a hobbyist approach to computing. To me it is still great fun. I am also impressed by the theoretical beauty of the latest developments'



**How will the various national software markets interrelate?**

We should find a great deal of co-operation. Already Japanese companies are making inroads into the American and European markets. No doubt there will a reverse flow of ideas and products.

**Do you see MSX as being a viable business system, particularly with MSX-DOS on the horizon?**

I don't want to see MSX in the office, though it may be suitable for some situations. With 64K of memory, a Z80 processor, a printer, disk drives and so on attached, an MSX computer will rival any comparable eight bit micro in the office environment.

**How will you maintain compatability between eight, sixteen and 32 bit versions of MSX?**

I can't comment on that at this stage, though I must stress that all MSX micros will be upwardly compatible. You will be able to run today's software and peripherals on future generations of machines.

**Will the need to maintain upward compatability inhibit development of future MSX machines?**

There is certainly a cost factor to be borne. It won't be cheap maintaining the upward compatability, and we may not to be able to use the very latest technology when it first becomes available. The benefits will be worth it though.

**How can you see MSX expanding?**

There will obviously be upward expansion, with machines having more and more peripherals, better specifications and features. There is also horizontal expansion.

That is the linking of MSX to other consumer products such as video, television, audio systems and so on. However, I can't see MSX becoming a major home controlling device. It can handle a minimal amount of security protection and so forth, but it would need a very different system to run a computerized home. MSX is best suited to the control of video, audio and communication devices.

**How long before MSX becomes the standard in computing?**

It already is a standard, of sorts, and we will be devoting all our energies to making it more and more so. We are committed to MSX.

By now it was well past two in the morning in Tokyo. Kay had an early flight to catch, for another MSX meeting another country. ■



'Standardization is not as important as all that – it is the separation of software and hardware that is the most crucial ingredient of MSX'



Casio 8K MSX can be expanded to 64K. Japan's top game is Hyper Sports 2

need a video recorder and an MSX computer first. Then units such as the National CF-2601 Super Imposition Unit, Pioneer Video Art graphics tablet and Pioneer ER-101 video interface can be used.

Yamaha have developed a number of interesting devices. Two are card readers. One reads music, the other graphics. A card is passed through a reading device and the data is loaded into the computer. You can thus hold a library of cards that can be loaded in an instant. Yamaha also have a Japanese character word processor.

A budget rival to the cartridge is being talked about too. It involves mounting a legless blob of programmed silicon onto a board that slots into the cartridge slot. The main advantage is that it is cheaper than conventional cartridge software.

The software charts are dominated by cartridge programs. Best sellers at the moment include Konami's Hyper Sports 2, Activision's Pitfall 2 and Antarctic Adventure. There is a version of Athletic land, with Cabbage Patch Kids as the actors and Ghostbusters is being heavily promoted.

With all this activity, we can look forward to some exciting developments in MSX in the near future.

# FIND THE HIDDEN HITBIT KIT




**Pinpoint a square on our grid and you could win a super Sony outfit worth £650. Just solve ten clues**

**Someone, maybe you, is going to win a super Sony MSX system. All it takes is a bit of deduction, a postcard to us and Lady Luck to make sure you are first out of the sack.**

Up for grabs is the superb Sony Hit Bit HB-75B, as reviewed in our MSX Versus The Rest group test. It is a 64K MSX micro with a built-in suite of software, all the features you could want and worth around £300. In addition, the winner will also be getting the Sony HBD-55 Disk Drive, a 3.5in format disk drive unit with disk BASIC and the ability to store 360K of program. It costs around £350. We're sure you'll agree that it is a superb prize.

To win, you'll need to have your wits about you. See that ten by ten grid of squares? One of those squares contains the prize, and we want to know the letter/number co-ordinates of that square.

We're not leaving it entirely to guesswork. There is a sequence of ten instructions that will pinpoint the square exactly. You just have to make sense of the instructions.

The first instruction gives you a starting place. The rest send you on a path through the squares, with the last one you reach the answer we want. You'll find all the answers either in this issue or by applying the principles outlined in various articles. Even if you know nothing about computers, you should be able to work out the solution.

Once you have worked out an answer, write it on the back of a post card and send it off to us. Don't forget to write your name and address on the post card too. We'll accept entries up until last post of 31st May, 1985.

## TO ENTER

One square on the coded grid contains the prize. Directions to find that square are given by the ten questions. Answer them correctly, follow the instructions and you will end up at the right square.

Write the co-ordinates of that square on the back of a postcard and send it to:
Sony MSX Competition,
What MSX?,
38-42 Hampton Road,
Teddington,
Middlesex TW11 OJE.

All entries must reach us by last post of 31st May, 1985.

The first correct entry drawn after that date wins the prize.

## QUESTIONS

**1. Start at the hexadecimal equivalent of 179.**
**2. Go two left if the HB-75B has an RGB socket.**
**3. Go down the number of keys on the cursor keypad.**
**4. Go right the number of letters on the red key on the Hit Bit.**
**5. Go up the number of tone channels on an MSX micro.**
**6. Go left the number of bits in a nibble.**
**7. Go diagonally South-East the equivalent of binary 101.**
**8. Go up the number of shift keys on the Hit Bit.**
**9. Go left the number of Sony joystick models.**
**10. Go two up, three right, one down.**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|
| A | | | | | | | | | | |
| B | | | | | | | | | | |
| C | | | | | | | | | | |
| D | | | | | | | | | | |
| E | | | | | | | | | | |
| F | | | | | | | | | | |
| G | | | | | | | | | | |
| H | | | | | | | | | | |
| I | | | | | | | | | | |
| J | | | | | | | | | | |

## RULES

*1. Entries should be on a postcard clearly marked with the name and address of the entrant.*

*2. A Sony Hit Bit HB-75B MSX computer and HBD-55 disk drive will be offered to the first correct entry drawn after the closing date.*

*3. The judges' decision is final and no correspondence will be entered into.*

*4. The competition is not open to employees of Haymarket Publishing, their agents or suppliers, nor the employees of companies participating in the competition. No overseas entries can be accepted.*

# SWEET SOUNDS OF SUCCESS

## Yamaha's blend of MSX computer and synthesizer is a great combination




**YAMAHA CX-5M** **£449.00**

**Synthesizers have been enjoying a boom in recent years. The best, with every conceivable musical and electronic feature, have changed the face of modern music. Mass market models have become less and less costly, yet pack more and more in. Then there has been the boom in home computers, with many running musically orientated programs.**

Even so, home computers have stayed home computers and synthesizers have stayed synthesizers. Yamaha are changing all that, with their CX-5M MSX computer, priced at around £449. It is a full blooded synthesizer and a 32K MSX computer. Despite the high price, Yamaha are selling all they can get their hands on.

The synthesizer element makes the CX-5M a radically different proposition from other MSX computers. The difference is the built-in synth, called an FM Sound Synthesizer.

In addition to the computing powers of the MSX part of the CX-5M and its musical abilities, Yamaha buyers can also add a range of musical peripherals. These include two keyboards and four cartridge-based programs. With these you can compose music, expand the sound commands of MSX BASIC, generate new sounds or interface the CX-5M to Yamaha's DX-7 synthesizer. Those of us with a musical bent will be drawn to the Yamaha like bees to a honeypot.

In examining the CX-5M, we have to look not only at its abilities as an MSX micro, but also at the features of the synthesizer unit. We've also tried out the cartridge programs, as anyone interested in the CX-5M will almost certainly be interested in the programs.

Prices break down as follows.

| | |
|---|---|
| Yamaha CX-5M | £449 |
| YK-01 mini keyboard | £85 |
| YK-10 standard keyboard | £165 |
| YRM-101 FM Music Composer | £36 |
| YRM-102 FM Voicing Program | £36 |
| YRM-103 DX-7 Voicing Program | £36 |
| YRM-104 FM Music Macro | £36 |

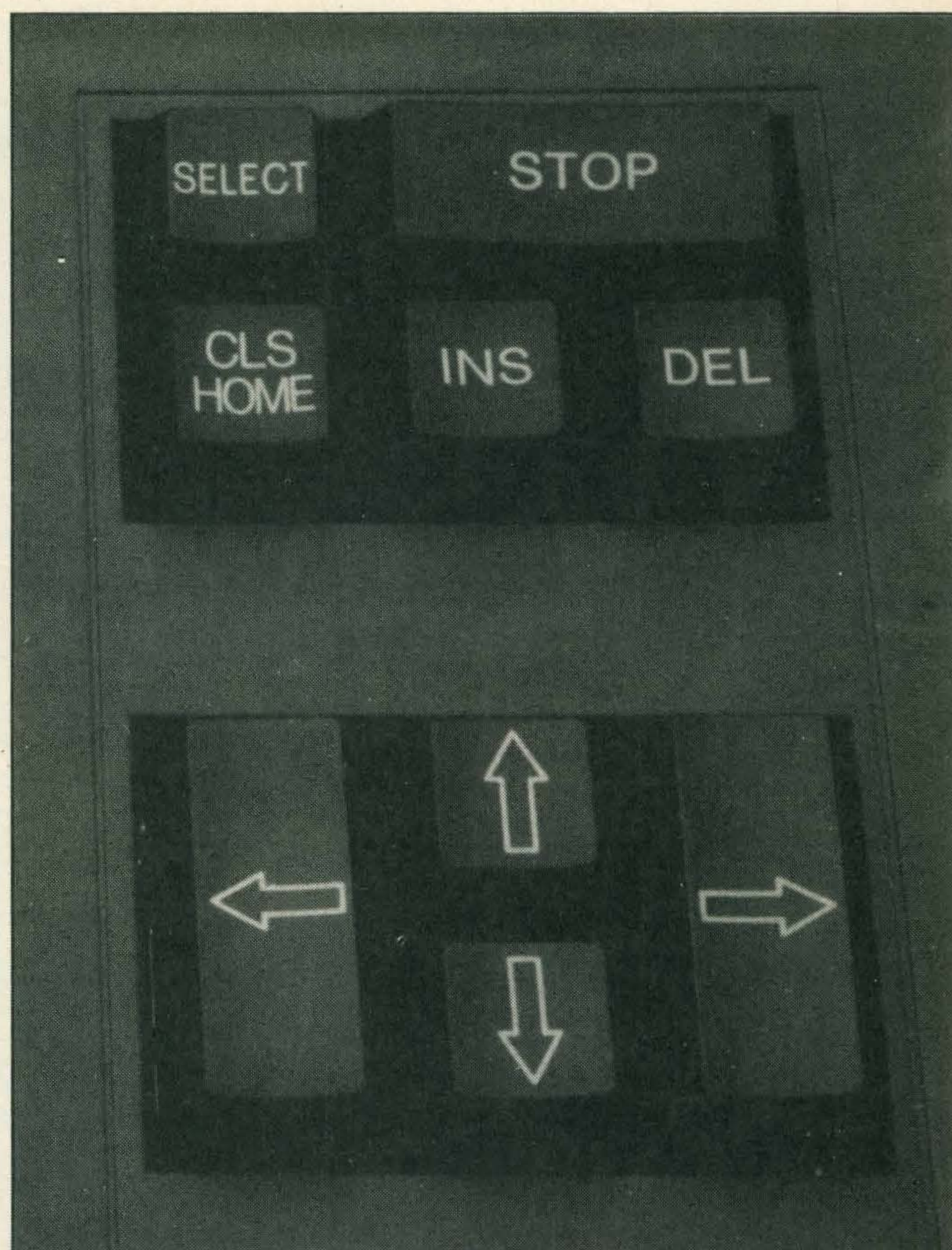
To use the Yamaha as any sort of musical instrument, you'll need a keyboard. That means a minimum spend of £534. For that amount you could buy a top 64K MSX micro and a pretty good portable synthesizer from the Casio range. The CX-5M needs to be good to justify its price.

It is.

**'Those of us with a musical bent will be drawn to the Yamaha like bees to a honeypot'**

You can buy the CX-5M without a keyboard, though most dealers will be keen to sell you a two box package. Let's see what's in the computer box first.

The box contains the CX-5M, a large transformer unit, an owner's manual, a BASIC manual, RF and remote cassette leads. At first glance, it seems like a fairly normal package.



Control and cursor keys are bunched together on the right hand side

As MSX computers go, the CX-5M is not quite as well specified as the rivals. For a start, it is limited to 32K of user memory. That means it won't be able to run MSX-DOS, or CP/M software for business applications. You may also find that some commercial games will need more than 32K of memory, thus restricting your software choice. Word processors and data bases will store less data too. Still, for the average home user, 32K is not a major limitation, and we rather suspect that the Yamaha will be bought for its musical, rather than computing power.

The main body is on a par with other MSX micros as far as size goes, despite the large external transformer that plugs securely into the back of the keyboard section. The size is because of the FM music synthesizer in the computer.

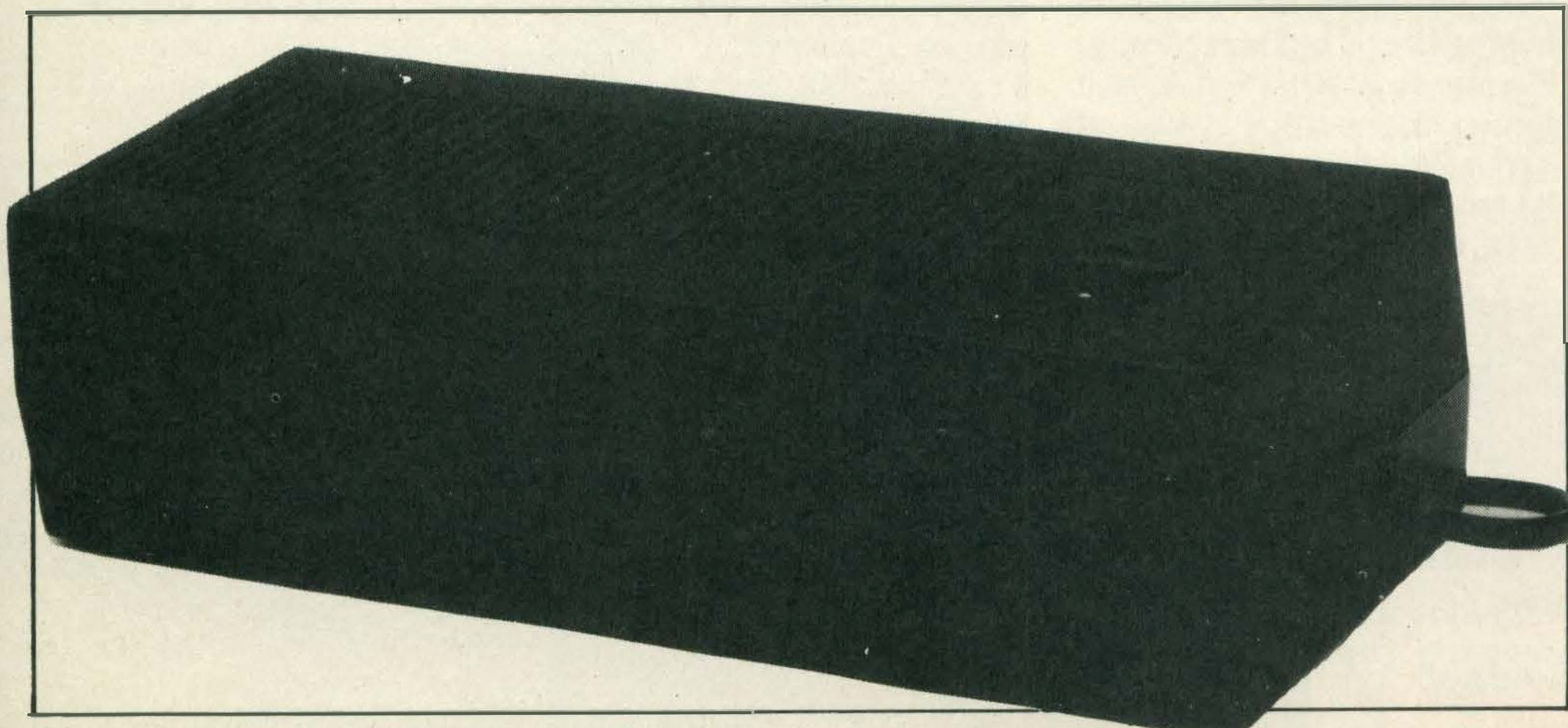
A metal plate on the base of the CX-5M coves the synthesizer gubbins, a PCB some 11cm square with five sockets to reach the outside world. No, the unit cannot be fitted to other MSX computers.

The synthesizer has an oblong, 20 pin socket for the keyboard, two phono sockets for output of the left and right sound channels plus two five pin DIN sockets for MIDI interfacing.

Apart from these extra goodies, the CX-5M is similar to other MSX machines.

It is finished in shades of grey with white printing on the keys. There are 48 alphanumeric keys, including a blank key that gives European accents if used in conjunction with the SELECT key.

The five function keys line up above the keyboard. Shift keys


Separate transformer is bulky but does not overheat at all



are oversize and the return key easily found. The CAPS key has a built in engaged light.

Cursor control keys are clustered on the right. Left and right keys are large enough, the up and down keys are normal keys. For hard, fast games playing, it is not a terribly satisfactory arrangement, and a joystick will be a useful buy. Still, for use with the music programs, the cursor keys are quite good enough.

Above them is a cluster of five control keys, including the STOP key. One-handed pressing of CTRL and STOP is a physical impossibility.

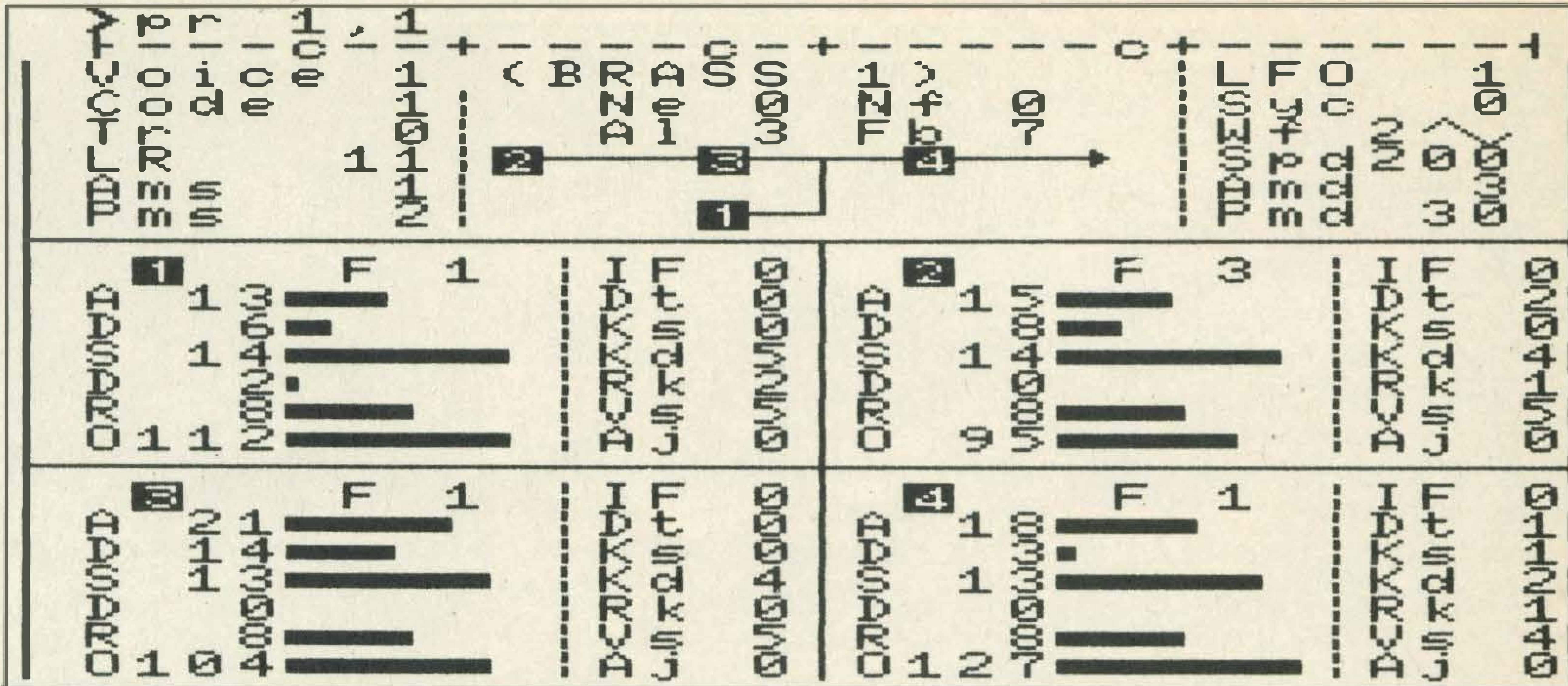
All the keys are nicely sculpted and the entire keyboard is at a comfortable angle. There is a little give to it, detracting from the overall appeal. As MSX keyboards go, the Yamaha is not quite up with the best.

Synthesizer connections aside, it comes up a little poorly too in the interface stakes. On the right you'll find the usual two nine-pin joystick ports. The back has a socket for the transformer, RF, video and audio phono sockets and an Amphenol type Centronics printer socket. That's all standard.

So too is the cartridge port on the top of the casing. It has an internal reset switch so that inserting a cartridge will cause the computer to momentarily switch off and thus not damage the cartridge.

There is no second cartridge slot. On the back there is an edge connector with 50 contacts. To use a second cartridge or cartridge-fit peripheral, you will have to buy the £19 CA-01 Cartridge Adaptor. This fits the rear connector and allows a second cartridge to be used.

In use, as a computer, the Yamaha performs well. The separate transformer keeps very cool indeed, even though it is a rather thirsty beast, consuming 30W of power. The 64K Sanyo MPC-100 uses a third of this. Picture and sound quality is as good as monitors, TVs, amplifiers and the like allow.



What you see on screen with the FM Voicing program, as dumped to a Toshiba HX-P550 printer

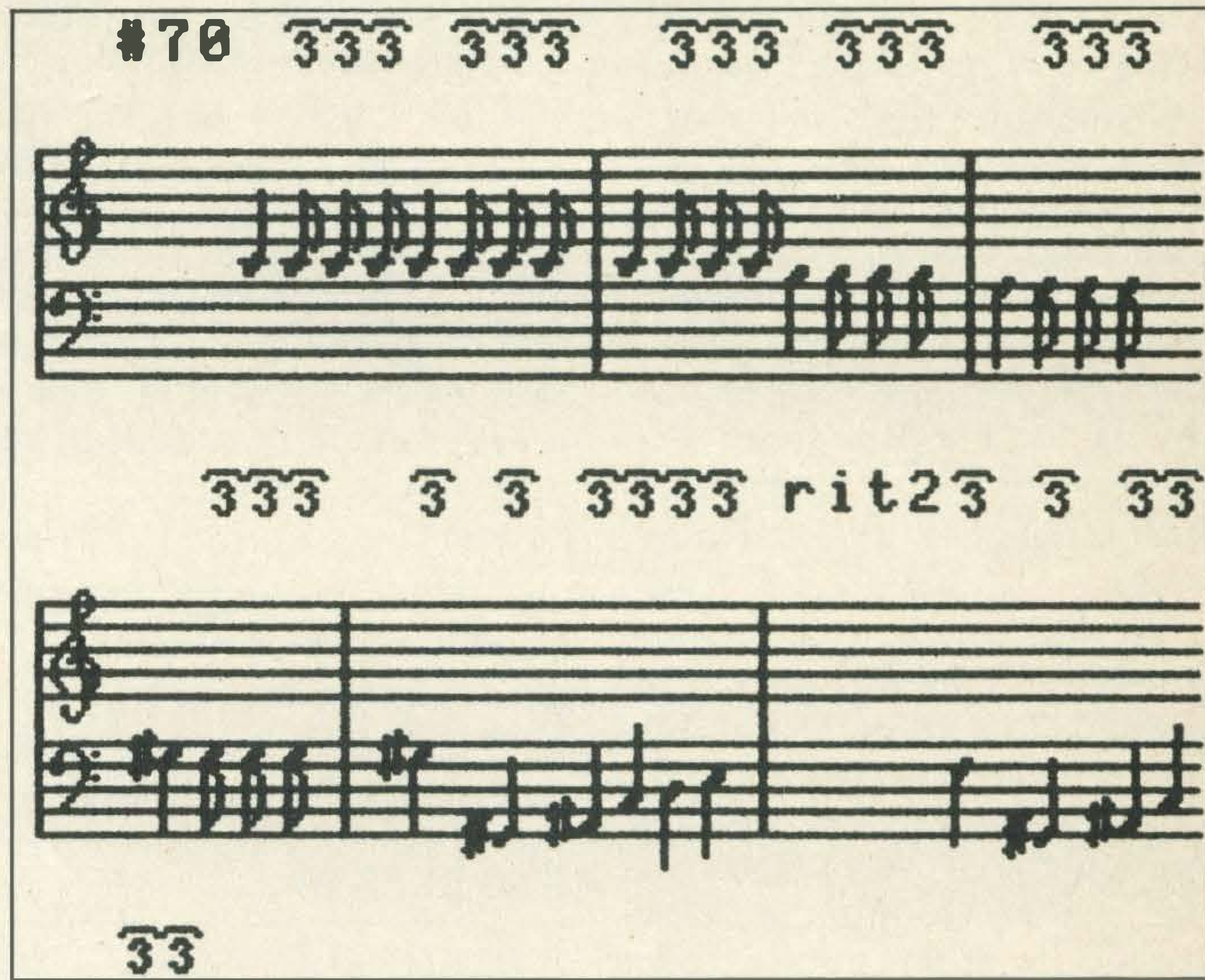
**'Yamaha owners may come to rue the omission of a second expansion port'**

Documentation is more concerned with the musical aspects of the CX-5M. The Owner's Manual explains the keyboard, setting up and how to use a cassette recorder. The BASIC manual is a command by command guide to MSX BASIC, with little on how to program. If you want to learn to write BASIC programs, and use the computing ability of the CX-5M, you'll probably be paying a visit to your local bookshop.

So much for the computer side of the Yamaha. Though it may not be a match for the 64K rivals as an MSX micro, it easily outstrips them when it comes to music.

The on-board music equipment is called an FM Sound Synthesizer. The FM stands for Frequency Modulation, and it refers to a particular way of generating sounds that Yamaha have developed.

To access the synthesizer, enter the command "CALL MUSIC". The screen display changes to an array of five blocks showing what noises the instrument will make, details of the rhythm section and so on.



Score printed out and written with the FM Music Composer program

The program is able to generate up to eight different voices, or sounds. There is a range of 46 pre-set voices to choose from. You can add automatic rhythm and bass accompaniments, record and playback passages of music up to 2000 notes long and output a stereo signal through hi-fi, an amplifier or MIDI devices. MIDI stands for Musical Instrument Digital Interface and it allows different electronic instruments to be controlled from a central device.

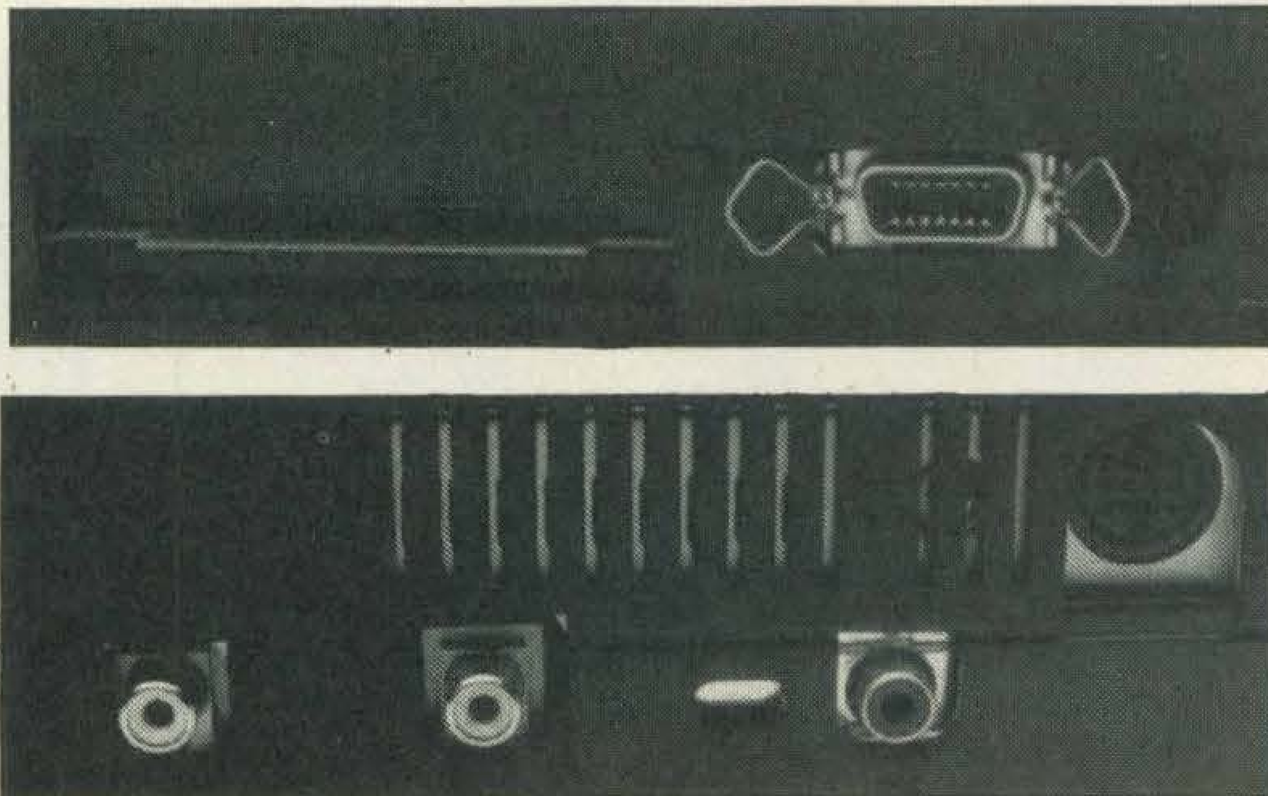
Learning how to play it properly will take time, study of the manual and your own musical talent. When you first switch to the synthesizer mode, you'll have BRASS 1 as the sound, no rhythm accompaniment and the keyboard split at Middle C. That means that notes above this will be sounded one at a time, notes below can be played as chords of up to seven notes. This is known as the poly/mono keyboard split.

The 46 voices cover a wide range of sounds. You can choose from brass, trumpet, strings, organs, flute, oboe or clarinet if your tastes are classical. For modern music, there is 'funky electric bass', electric organ and three electric pianos. DIY rhythm can be supplied by snare drum, steel drum, timpani or plain percussion.

More unusual instruments are provided too — harp, clavinet, koto, zitar, vibraphone and bell. There are







Two standard joystick ports are provided, above

Rear 50-pin interface is, unfortunately, non-standard

Power socket is on back, top right, above phono sockets



Main keyboard is reasonable without being an outstanding feature. A musical keyboard is worth buying

even some non-instrumental sounds, such as raindrops, bird chirping, train, ambulance and cow bells.

You can alter the keyboard split to either reverse the poly and mono halves of the keyboard, or to give either entirely mono or entirely polyphonic sound. The only thing you can't do is play with more than two different sounds.

What you can do is add rhythm and bass accompaniment, so your music can have percussion, solo bass and rhythm chords accompanying it. There are six preset rhythms.

Solo bass accompaniment gives you a choice of six instruments — two bass, guitar, horn, brass and flute.

**'You can subtly alter the nature of the sound, the length of the notes overlap, tonal brilliance and so on'**

The last four are also the options for chord accompaniment.

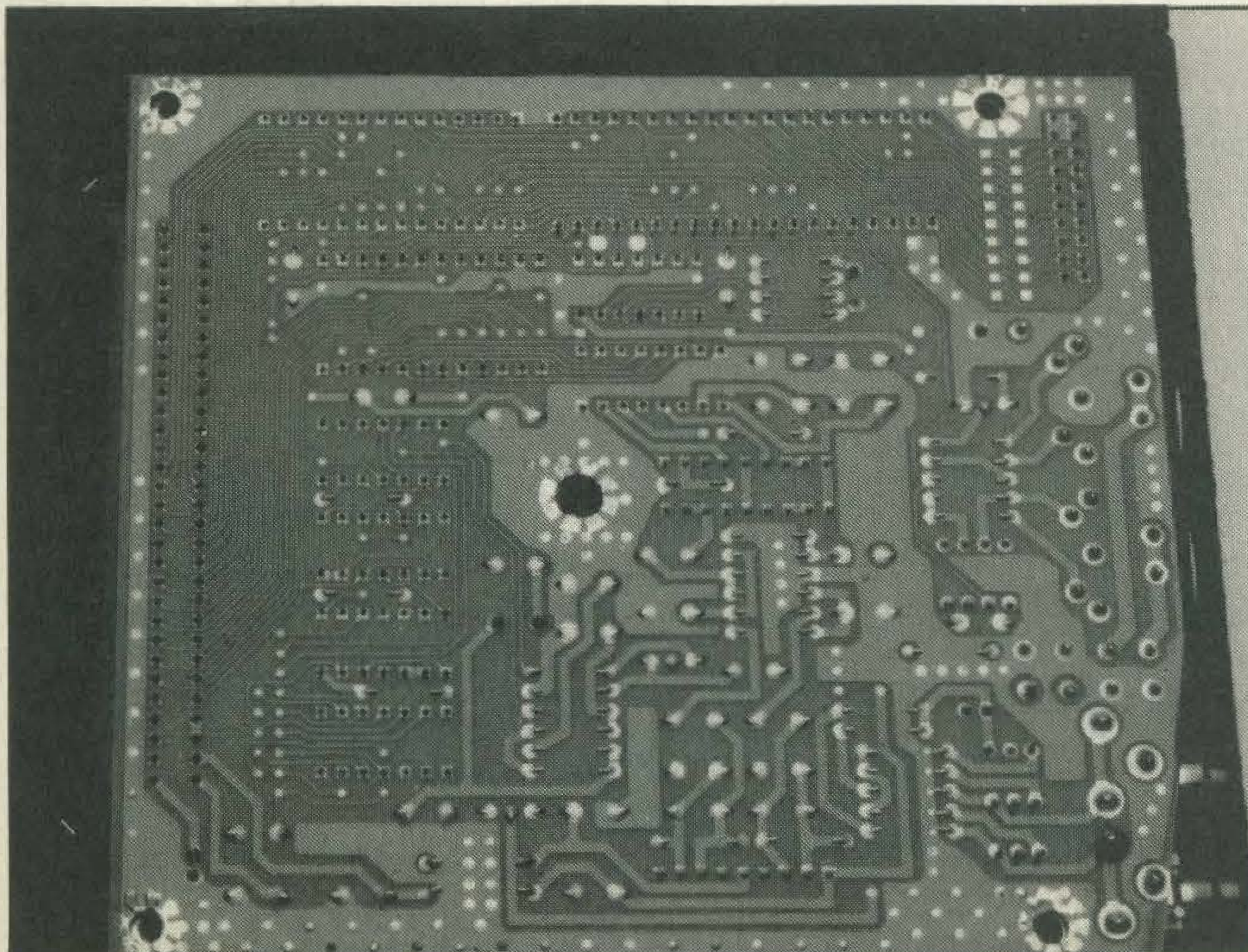
Solo bass accompaniment is automatic and goes with the rhythm. Chord bass also goes with the rhythm, but the chord played depends on which of the fourteen lowest keyboard notes is pressed. This restricts the number of keys you can use for normal playing.

Accompaniment can have its tempo raised or lowered, volume adjusted and you can opt for minor, seventh or minor seventh chord accompaniment.

So, with the FM Sound Synthesiser you can make very sophisticated music with a minimum of effort. You can have a playing sequence saved as you play it, and replayed with you adding live keyboard accompaniment. You can save performances to tape, and reload them (this is a slow business, so use long tapes). And, when you get more experience, you can subtly alter the nature of the sound, the length of the notes overlap, tonal brilliance and so on. In short, you can do an awful lot, musically, with the FM Sound Synthesiser.

The YK-01 keyboard is fine for the home musician. It spans nearly four octaves, is 55cm long and can be played quite comfortably on the knees. The keys are smaller than those of a normal piano, and you may want to invest in the larger YK-10 keyboard if you plan to play a great deal.

Once you get used to playing the thing, you may want to start writing your own compositions. For that you'll need the FM Music Composer cartridge, and a printer so you can print out musical scores. The latest versions of the programs work with Epson-compatible printers as well as MSX printers.


This is what the FM Sound Synthesizer looks like from underneath

The composer stores up to 8239 items of data (less if you are using sounds you have made up yourself). You can write in up to eight parts, using up to eight sounds, and easily edit scores when they have been entered. Composer is a bit like a word processor for musicians.

Notes can be entered either by keyboard, by menu or played in. To make the most of the program though, you'll have to study a lengthy manual. A knowledge of musical terms will certainly make some of the more arcane points clearer.

The first steps are easy enough. Select a part, a musical key and a time signature. Two staves are shown on the screen, one treble, one bass. Below that is a menu, with note and other options, and below that the part number, bar number and memory left. A command line shows your input.

Inputting scores is a tedious business until you get used to it. You have to select the length of note, down to a hemidemisemiquaver (1/64th note). You then select the position on the stave by moving the cursor up or down, using alphanumeric keys or playing the note on the musical keyboard. If you are entering notes of different lengths, you'll have to go back to the menu to alter the length. Similarly, if you want to enter flats, sharps, naturals, ties, triplets, dots, rests or compound notes, it is again back to the menu.

Using the musical keyboard is the easiest way to enter notes, but it is not quite as simple as playing a melody and watching it appear on the screen.

When it comes to editing a score, the Yamaha program comes into its own. Use the insert, delete and backspacing keys to amend or correct your music. You can clear an entire part or voice with a few keystrokes, overwrite wrong passages and copy bars to other sections of the score.

In addition to conventional note entering, the program allows the full range of musical marginalia to be used. You can alter the dynamics from very soft (ppp) to very loud (fff). Individual notes can be accented, or passages gradually made to increase or decrease in volume, to give crescendos or decrescendos. Musical tempo can be adjusted, notes extended or sustain added. You can alter the way a note sounds too, by altering its voiced and unvoiced length. Vibrato and tremolo can be adjusted, the volume of each part set to a different value and parts fine tuned or transposed on the musical scale by up to 24 semitones. What's more, you can make very subtle changes in these factors too, allowing far greater control than even the most accomplished musician could achieve.

To make the most of this program, you'll need to know a crotchet from a quaver, and take the time to learn its features. Master it and you'll easily be able to write very complex scores. Even if you aren't experienced, it is an excellent way to learn about music in the comfort of your own home.

The voicing program (YRM-102) is to generate your own sounds, and a must if you like playing around with noises. To use it, you'll have to learn about how Yamaha's FM sound generation system works and spend plenty of time experimenting.

Up to 48 new voices can be generated. The keyboard will give the voice you are working on and a comparison voice.

Data can be printed out, saved to cassette, swapped with other data and copied. You can alter all the parameters in the voice, once you understand how sounds are constructed.

On screen you are presented with all relevant voice data. The manual gives a good idea of how to proceed and a few sample noises to program for yourself. But the real value of this program only comes when you start playing around for yourself. It is not a program for the average home musician; it is more suited to synthesizer players who want to experiment with new sounds.

The DX-7 Voicing Program is very similar but uses the facilities and sounds of the DX-7 synthesizer for the sounds generated. The main difference is that the DX-7 has six sound generators, compared to the four of the CX-5M.

The fourth cartridge is of great interest to BASIC programmers. The FM Music Macro adds no less than 36 new commands to MSX BASIC, allowing the facilities of the FM synthesizer to be used in BASIC programs.

## LIKES

**Musical facilities**

**Cartridge programs**

**MIDI interface**

The program takes nearly 9K of RAM. It allows you to write programs using any four of the voices in the synthesizer, plus a percussion part. Sound can be output through the MIDI interface.

The commands are all prefixed by CALL or _ and the lengthy manual explains them quite clearly. There is a certain similarity between the FM Music Macro and the normal sound commands of MSX BASIC, but the Music Macro can do so much more, and is easier to work with. You can pick and choose instruments at random, generate your own rhythm, fine tune pitch and volume, play sections of a track, list the available voices and even output a synchronising signal to a cassette recorder.

For non-musical purposes, there are three commands that enable you to load to and from data cartridges, if you have a second cartridge installed. You can of course combine the Music Macro commands with normal BASIC, and this means you can combine music and graphics, or build super sound effects into games. Unfortunately, you won't be able to run these commands on computers without the FM Music Macro.

The only problem is that because the program uses the interrupt routines from both the computer and the synth unit, keyboard scanning is slower than normal. You have to be very deliberate in entering programs. It is all too easy to press a key and not have it register — an annoying feature of the program. This aside, it is a wonderful utility for BASIC programmers.

## DISLIKES

**Single cartridge port**

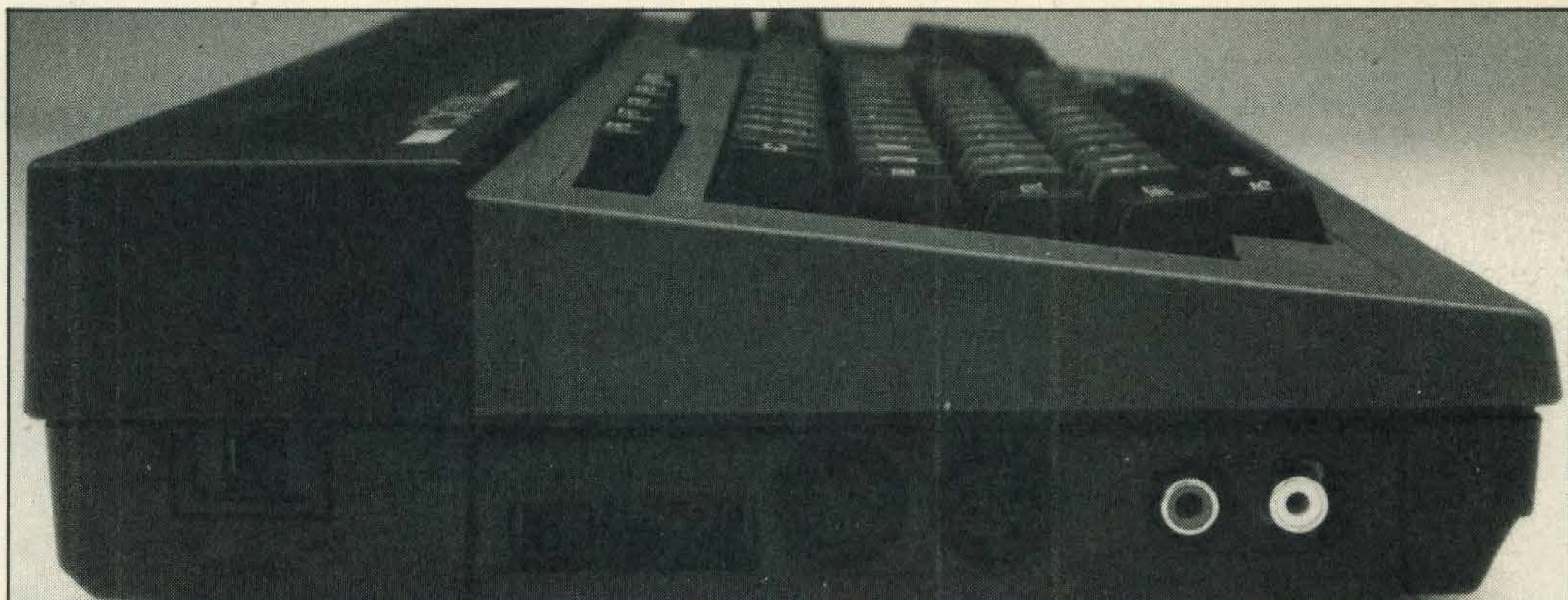
**32K RAM**

**BASIC documentation**

## Verdict

**As you may have gathered, we liked the CX-5M. As an MSX computer, it has a few shortcomings, but as a synthesizer for the home or even the studio, it is a super instrument. The programs are worth investing in too, though which ones will depend on your interests.**

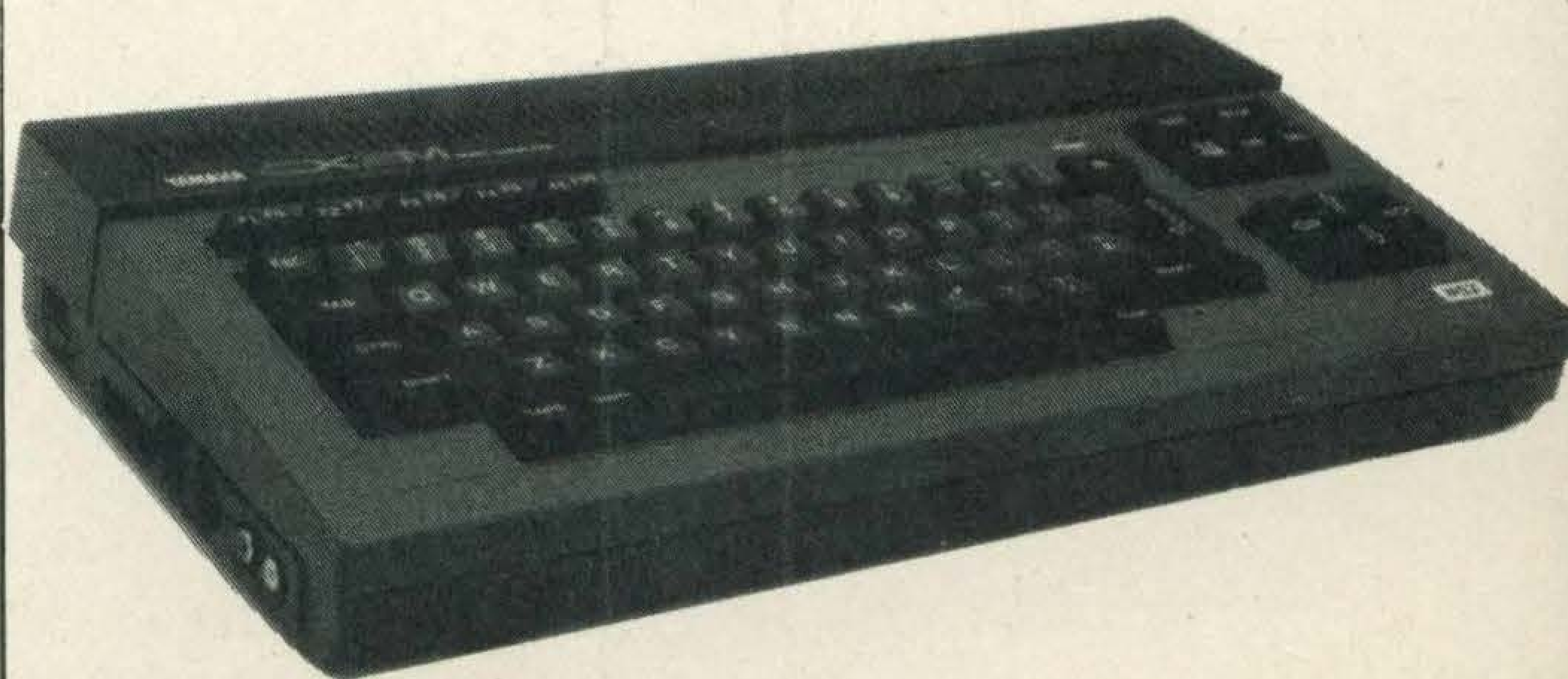
**There is no direct competition to the CX-5M and the price means it is likely only to appeal to those with a keen interest in music. If that sounds like you, you'll like the sound of the Yamaha, and find it a good computer as well.**


Extra interfaces for the synth — keyboard plug, MIDI DIN plugs and two phone sockets for stereo output

## YAMAHA CX-5M £449

## SPECIFICATION

| | |
|---|---|
| **CPU** | Z-80A equivalent (3.6MHz clock) |
| **MEMORY** | |
| **RAM** | 32K |
| **ROM** | 32K MSX BASIC |
| **VIDEO RAM** | 16K |
| **KEYBOARD** | |
| **TYPE** | Full travel |
| **KEYS** | 48 Alphanumeric<br>25 control keys<br>Cursor keypad |
| **NUMERIC KEYPAD** | No |
| **VIDEO DISPLAY** | |
| **TEXT** | 40 characters × 24 lines |
| **GRAPHICS** | Maximum resolution 256 × 192 pixels |
| **COLOURS** | 16 |
| **SPRITES** | 32 |
| **OUTPUT** | TV<br>Monitor |
| **SOUND** | |
| **GENERATOR** | 3 channels with 8 octave range |
| **OUTPUTS** | Mono audio output<br>2 × stereo phono jacks<br>2 × MIDI DIN sockets |
| **INTERFACFS** | |
| **JOYSTICKS** | 2 Atari standard |
| **EXPANSION BUS** | One |
| **CARTRIDGE PORT** | 1 |
| **PRINTER** | 1 × Centronics |
| **SERIAL PORT** | No |
| **CASSETTE** | 8-pin DIN |
| **OTHER** | Keyboard socket |
| **RESET** | No |
| **DIMENSIONS** | 422 × 207 × 68mm (W × D × H) |
| **WEIGHT** | 2.7kg |
| **POWER SUPPLY** | External transformer |
| **FINISH** | Light/dark grey case, dark grey keys with white lettering |
| **SOFTWARE INCLUDED** | FM Music Synthesiser |
| **SUPPLIED ACCESSORIES** | 1 video cable<br>1 cassette interface cable<br>2 instruction manuals |
| **DISTRIBUTOR** | Yamaha-Kemble Music (UK) Ltd, Mount Avenue, Bletchley, Milton Keynes MK1 1JE<br>Tel: (0908) 71771 |



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# SOFT SPOT

## We take a look at the cream of the latest MSX software.

**Quite a crop of quality software has been released since the last issue. What we have reviewed here is the cream of the crop and it shows that MSX owners now have a wide variety of excellent games, utilities and educational software to choose from.**

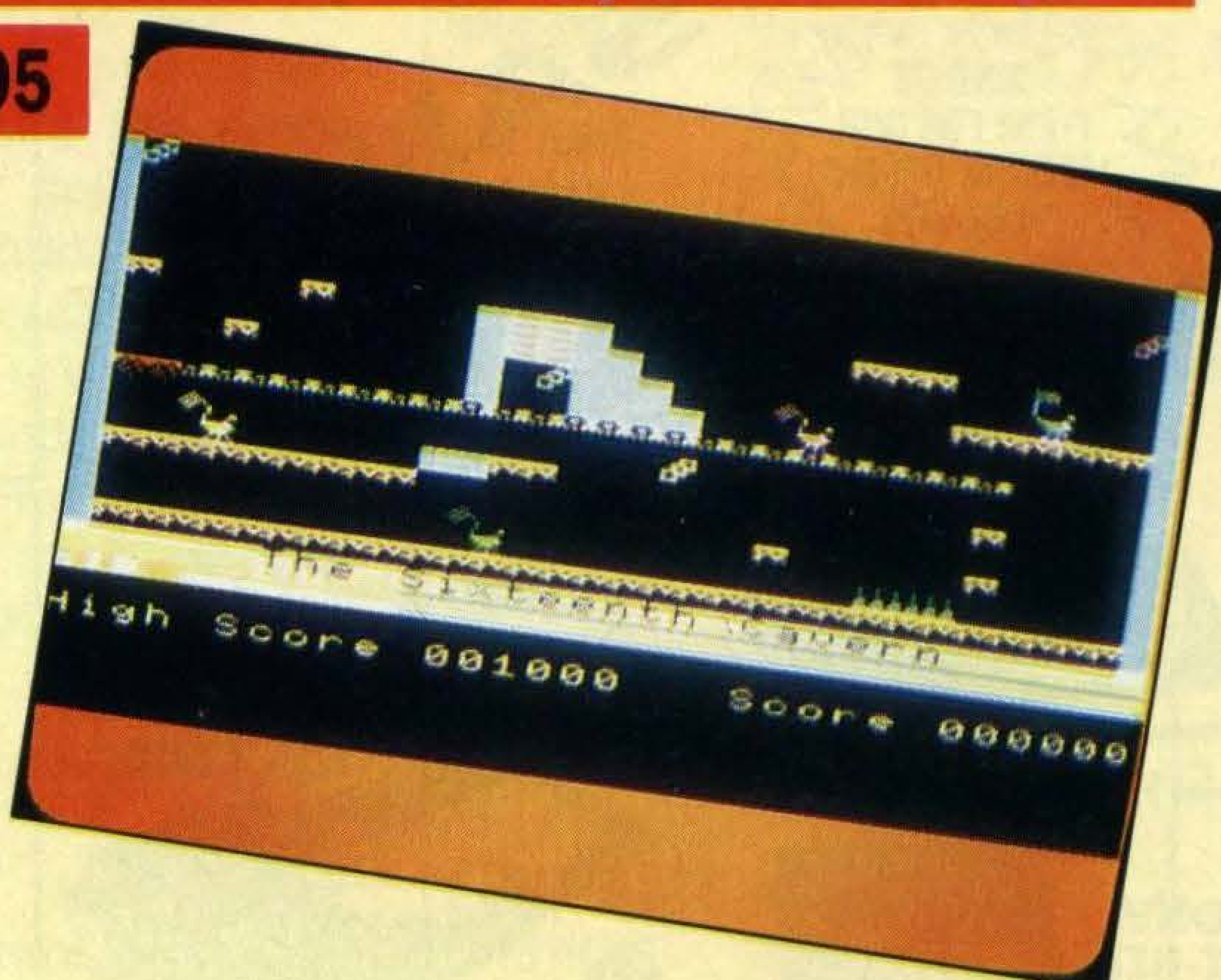
**We've chosen Manic Miner, an exciting and addictive arcade game to be our star game. Our games represent the best adventures, classic and traditional games currently available. In addition we have reviewed a BASIC tutorial.**

**All the programs are rated out of ten and the screen shots should give you an idea of what the game looks like.**




## Manic Miner — by Software Projects

**CASS: £7.95**




10

Manic Miner is a classic in every sense of the word. Brainchild of Matthew Smith, it first saw the light of day in October 1983. Since then it has never been out of the best seller charts. Now, after a conversion by Cameron Else, it can be played on MSX computers.

You control Miner Willy as he explores a series of 20 caverns deep below suburban Surbiton. Each cavern has a series of platforms and obstacles, a collection of various and humorous nasties plus a number of keys or other objects that must be collected.

After loading, the picturesque title screen details the various controls. A selection of keys or a joystick can be used. For some reason, cursor control keys are not used.

The movements are simple enough — left, right and leap. There is a game pause facility, a quit feature and the volume of the sound effects can be altered.

Do nothing at this stage and the game will go into a demonstration mode, showing off each of the twenty screens in turn. Use the wait facility to examine them in detail, for they are most amusing.

Each screen has a name, such as Eugene's Lair, Wacky Amoebatrons or Return of the Alien Kong Beast. The title gives some idea of the nasties in store.

Matthew Smith certainly has a perverse imagination. You've heard the phrase 'sweet sixteen'. The sixteenth screen has marauding sugar bowls and sugar cubes to collect. In the Attack of the Mutant Telephones, you have to collect ten pence pieces. The two Kong screens have bananas scattered around. Another screen has predatory pacmen, another has snapping lavatory bowls. Other foes include kangaroos, teddy bears, penguins, ducks and eyes. In the Skylab Landing Bay, you have to avoid falling skylabs. Such things add mightily to Manic Miner.

Besides the moving things, you also have to work out a safe path to collect all the objects. Hampering you are collapsing or moving platforms. In addition, you only have a certain time limit, indicated by an air supply line below the screen. You get points for every object collected and the time it takes to clear a screen. 10,000 points gains you an extra life. You start with three lives.

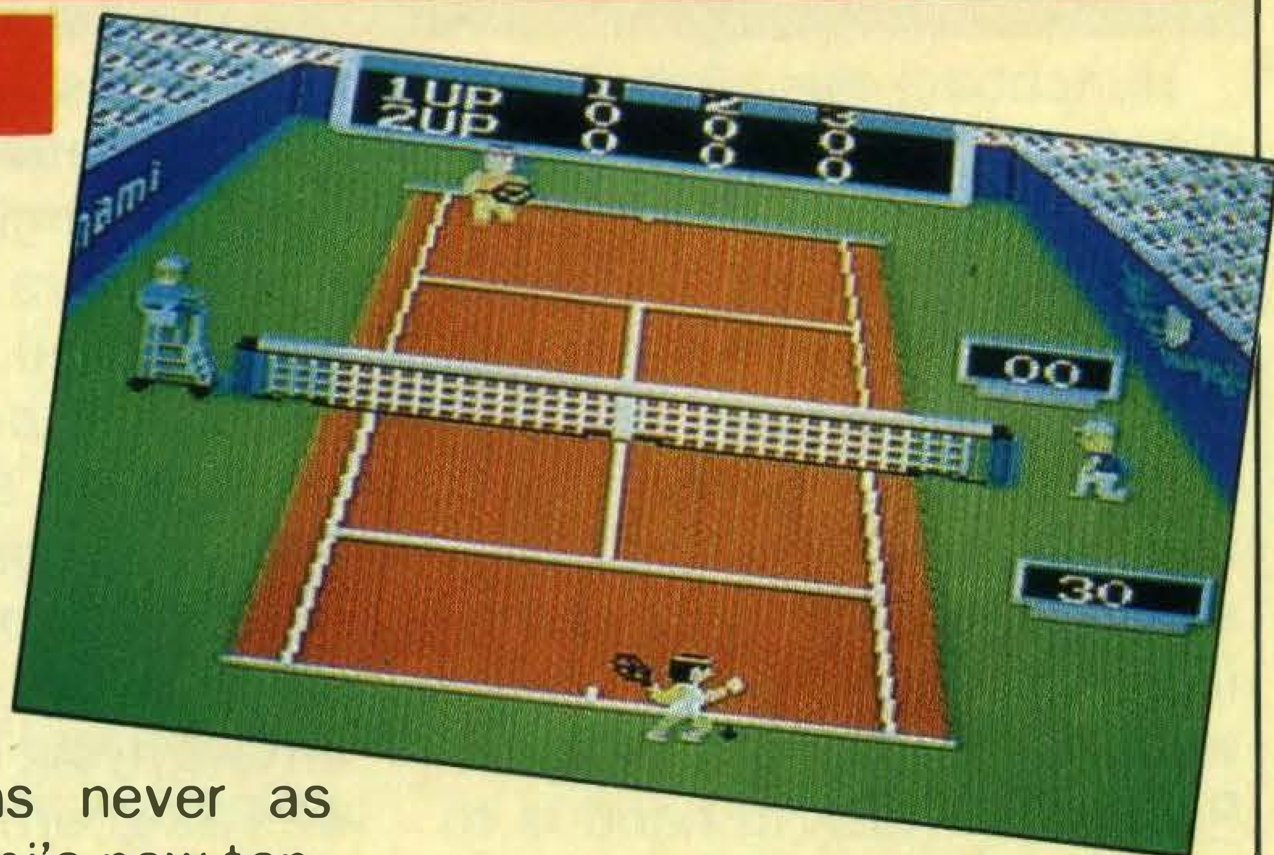
The opening screen has a very fair rendition of the Blue Danube accompanying it. During the game, the tune changes to Peer Gynt's Hall of the Mountain King, plus the sound of your movements.

The graphics are excellent. Sprites are detailed and colourful. Movement is smooth and sprite collision accurate.

An additional attraction is that it is not impossible to get some success in Manic Miner. There is enough of a challenge to keep you absorbed for months, trying to get through all the screens in the fastest possible time. But even beginners should be able to master a few screens.

Manic Miner is a worthy top game. If you haven't already got it, buy it tomorrow.

## Tennis by Konami




9

Wimbledon was never as exciting as Konami's new tennis game. We are hooked and guarantee that you will be too.

Three tennis game variations and three speed levels are available: a singles match with you pitting your skill against a computer-controlled opponent; a game against another player and doubles with you and a partner playing the computer.

The tennis court is pictured on screen with one end receding into the distance. The umpire sits on the familiar high chair calling out decisions — LET, IN, OUT, FAULT and no arguing allowed!

The players are women and so you only play three sets. The score board at the back of the court automatically records all scores.

Using either a joystick or keyboard to control the game you really do get the feeling that you are playing tennis. You improve dramatically with practice and soon you find yourself hitting lobs, volleys and crafty corner shots.

The players on court look amazingly realistic and even jump up and down while waiting for a serve. A black shadow accompanies the ball giving you some idea of the ball's position, height and speed.

Konami's Tennis is exciting, very entertaining and a real challenge. It's indoor tennis at its best.

## Snowman by Quicksilva

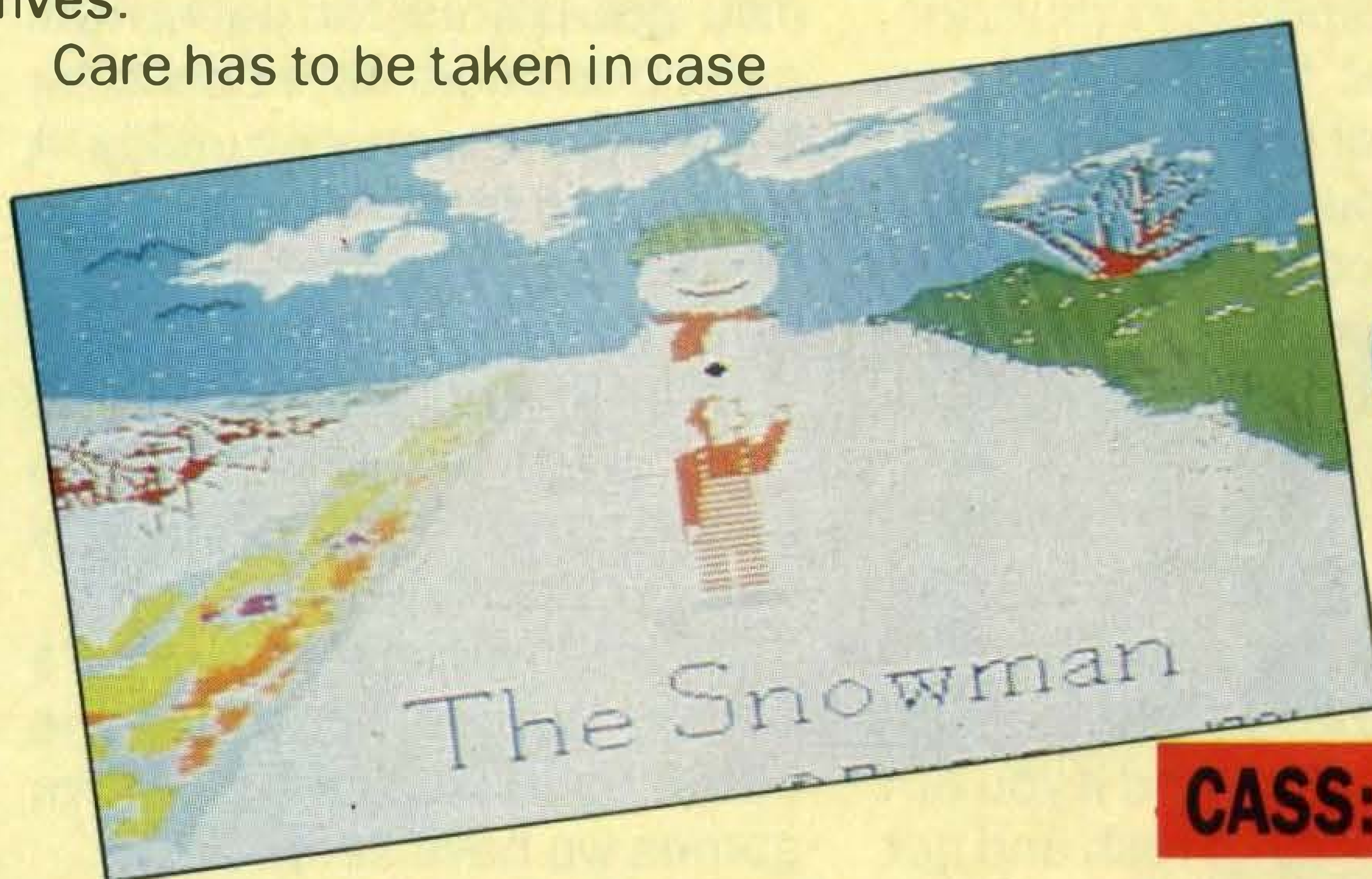
The Snowman is a platform game based on the children's book written by Raymond Briggs. There are four stages to it, each getting more difficult. The aim is to build a snowman by collecting snowflakes. Once he is built his eyes, scarf and other bits have to be collected. That takes two more stages. When he is complete, you must stop him from melting by collecting six ice cubes.

Throughout the game food such as turkey and Christmas pudding must be eaten to stay alive. A bar at the bottom of the screen shows how much energy remains. Run out of food and you lose one of your three lives.

Care has to be taken in case the little man falls off. If this happens an angel appears with a bed onto which he falls. All through the game there are of course enemies. For example little gas flames try to melt the snow which you need to build your snowman. An ice lolly or alarm clock gives you 20 seconds in which the gas flames cannot melt your snow or the boy can hang underneath the platform until the enemies pass over you.

The Snowman has a typical Christmas theme to it, with Christmas carols playing and snow falling continuously.

If you like a challenge then you will love this game.




8

CASS: £7.95

## Disc Warrior by Alligata

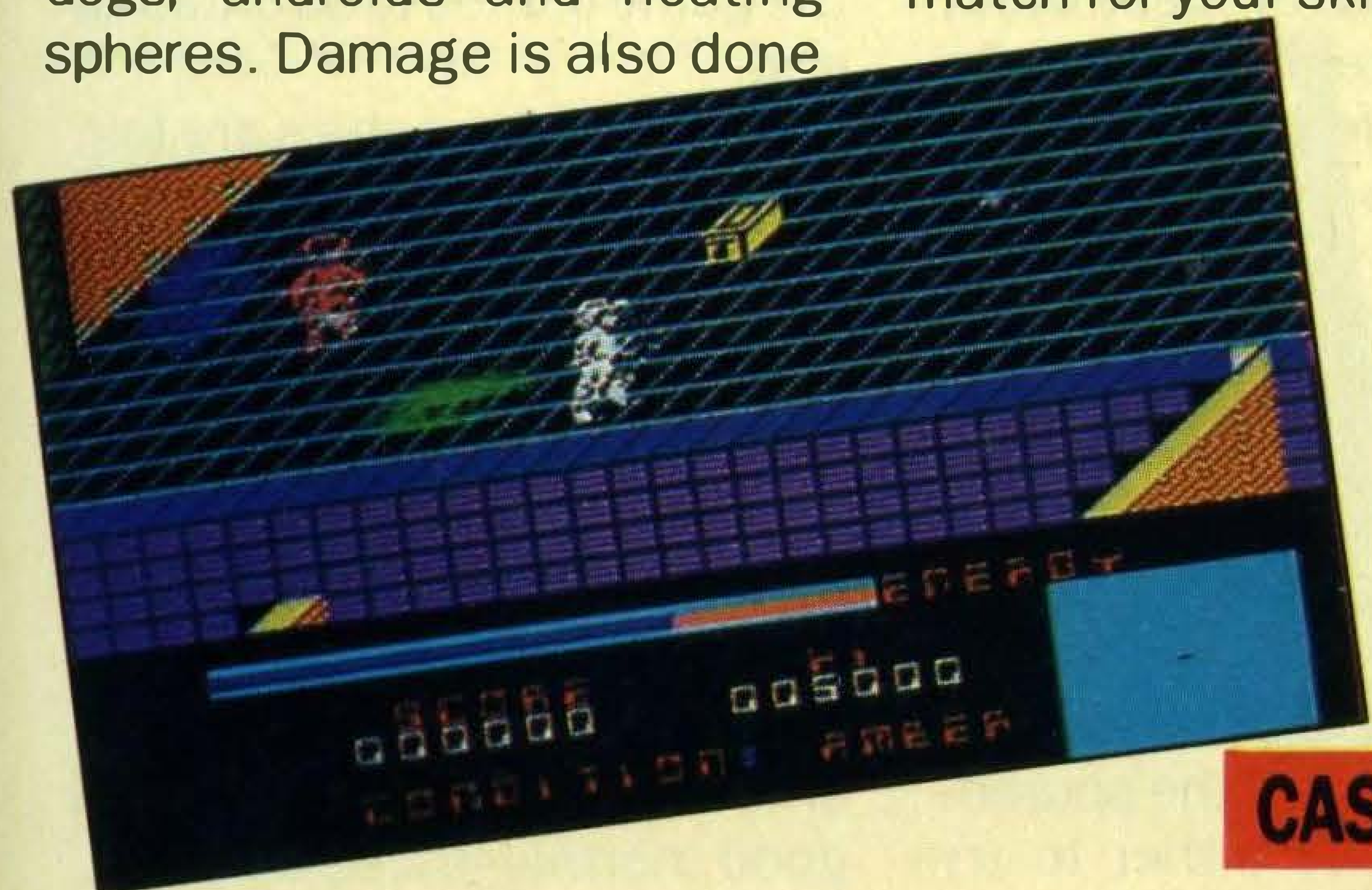
Billed as an arcade adventure, Disc Warrior is a rather different game from what we usually see. It is you against a massive computer complex, and your task is to destroy the master central processing unit.

On the screen you get an almost three dimensional view of part of the playing area, with a gridded floor and plenty of colourful detail. You move a white man around with either the joystick or cursor control keys.

Your attacking weapons are discs that boomerang back to you. An area sensor shows nearby attackers — robot dogs, androids and floating spheres. Damage is also done by force fields and electric floor panels. A bar below the screen shows how much energy you have left.

Besides staying alive, you have to collect various objects to help you in your mission. These include keys, a bomb, energy cells and rubber boots. Getting from one area of the maze to another is by either walking, teleporting or using a travel disc.

With good graphics and sound and a massive maze to explore, Disc Warrior will keep you wandering away for ages. Mapping will help you reach your goal, but we can guarantee you'll find Disc Warrior a match for your skills.

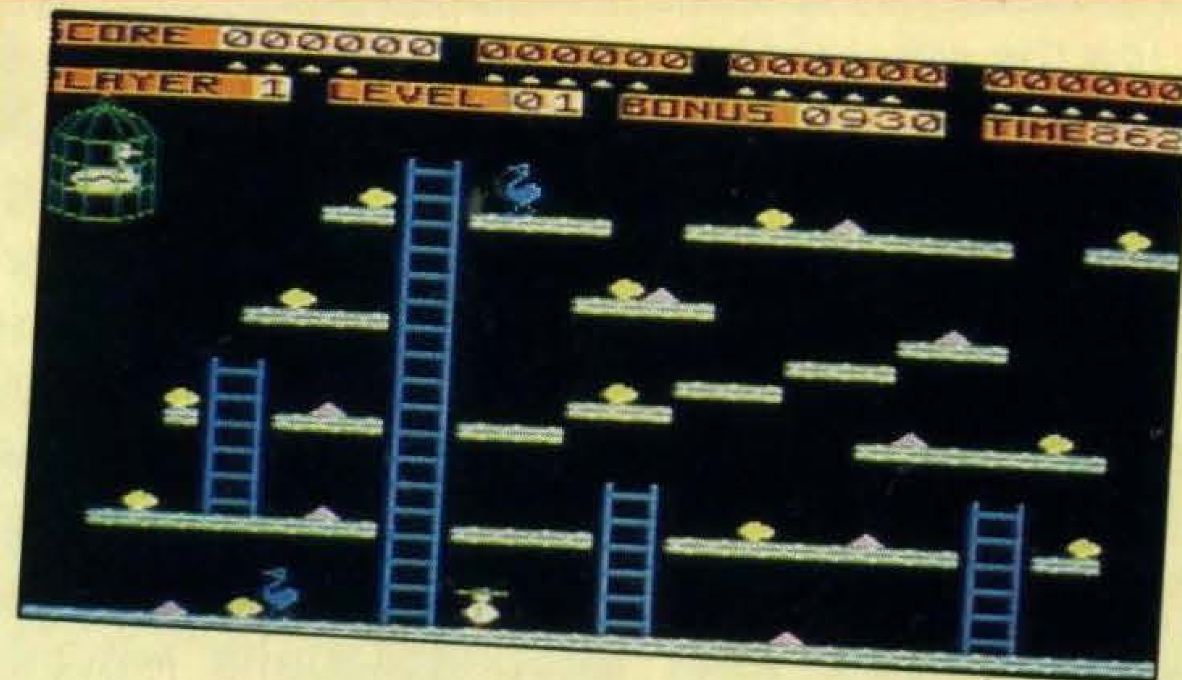



7

CASS: £7.95

## Chuckie Egg by A&F Software

CASS: £6.90




8

One of the most popular platform games has been Chuckie Egg. This MSX version is every bit as good as the original.

It is a platform game in which the object is to collect a dozen golden eggs scattered around the screen. Platforms are linked by ladders and elevators. Your little man can move left, right or jump.

Making life difficult for you are wandering blue birds. Contact with one is lethal. So too is not completing a screen within a given time limit. You have five lives to play with.

Loading is quick and reliable. A joystick or user defined keys can be used and from one to four people can play.

Points are gained for collecting eggs, piles of corn and completing each screen. As with most platform games, each screen needs a particular route. There are eight separate screens, with an additional yellow duck on the second round, more blue birds and faster action. All in all there are 256 screens to complete.

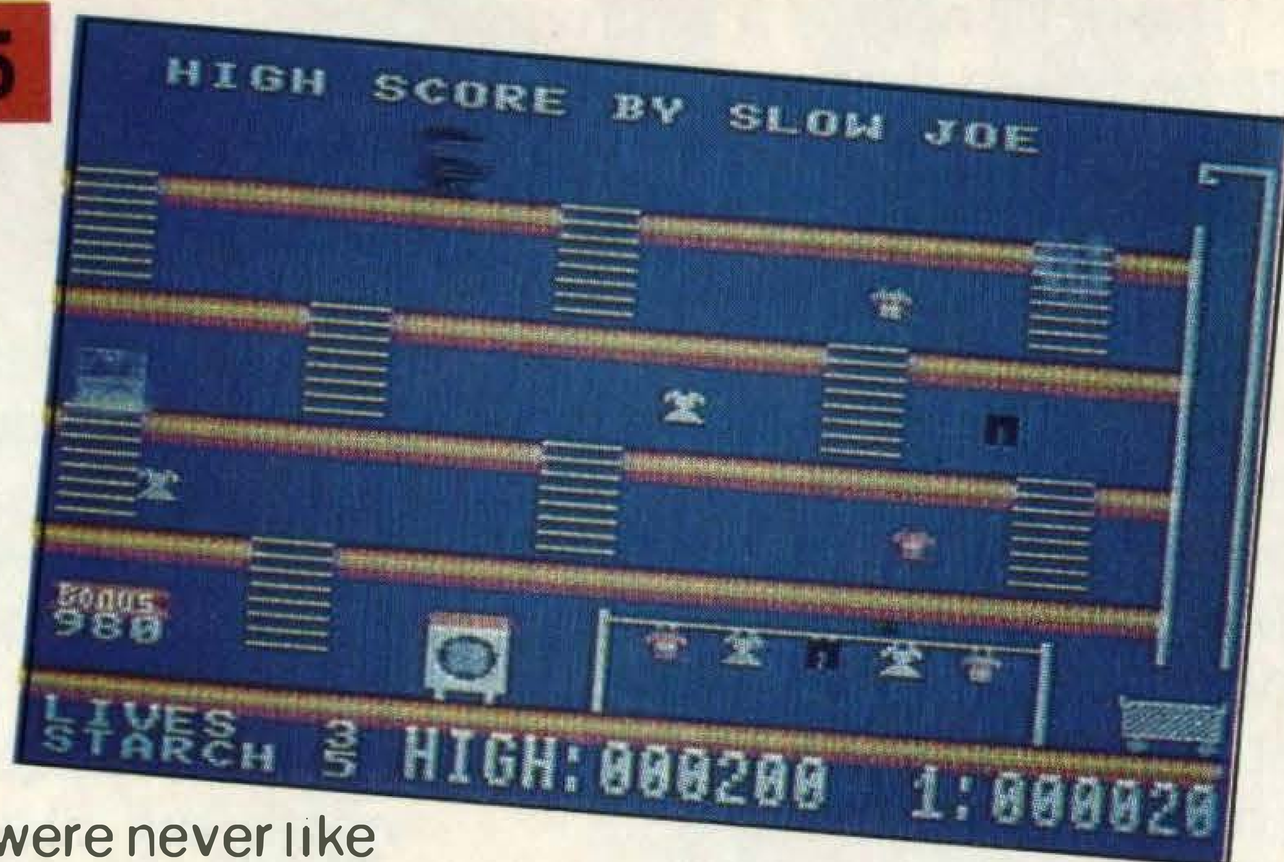
The graphics are made of only a few different elements. Movement is smooth and overlap problems not too noticeable. Collision detection is accurate too. The sounds consist of an introductory tune, walking noises and pickup noises.

Chuckie Egg is a most addictive game and a classic of its type. You'll spend weeks trying to master its many stages to get ever higher scores.

## Mr Wong's Loopy Laundry — by Artic Computing

CASS: £6.95

7




Laundry days were never like this. Mr Wong, the Chinese laundryman, is trying to gather his laundry. But there's a maniacal iron, deadly soap suds and an evil sack of laundry after him. It all sounds ludicrous but it makes an excellent platform game.

Menus at the start let you select one or two players, loud, low or no sound and joystick or cursor key control.

The Chinaman continues in his current direction unless you alter it.

You aren't totally defenceless. Firing gives off a burst of starch that temporarily immobilises the foe. Starch supplies are limited, and if you run out, you'll need to rush and get a refill. You have three lives at the start.

Laundry is picked up by passing over it and carried to the laundry chute. There are six items of clothing per screen. You get points for each item collected and a time bonus for finishing the screen quickly. A high score feature keeps track of your best efforts.

Graphics are excellent. A spinning washing machine adds to the effect. Sound is a continuous Ragtime melody that is decidedly catchy.

All this makes Mr Wong's Loopy Laundry one of the better, and wackier, platform games we have seen.

## Hunchback — by Ocean Software

Hunchback has all the ingrediants for a really good fairytale; the beautiful damsel in distress and the ugly admirer anxious to prove his love by rescuing her.

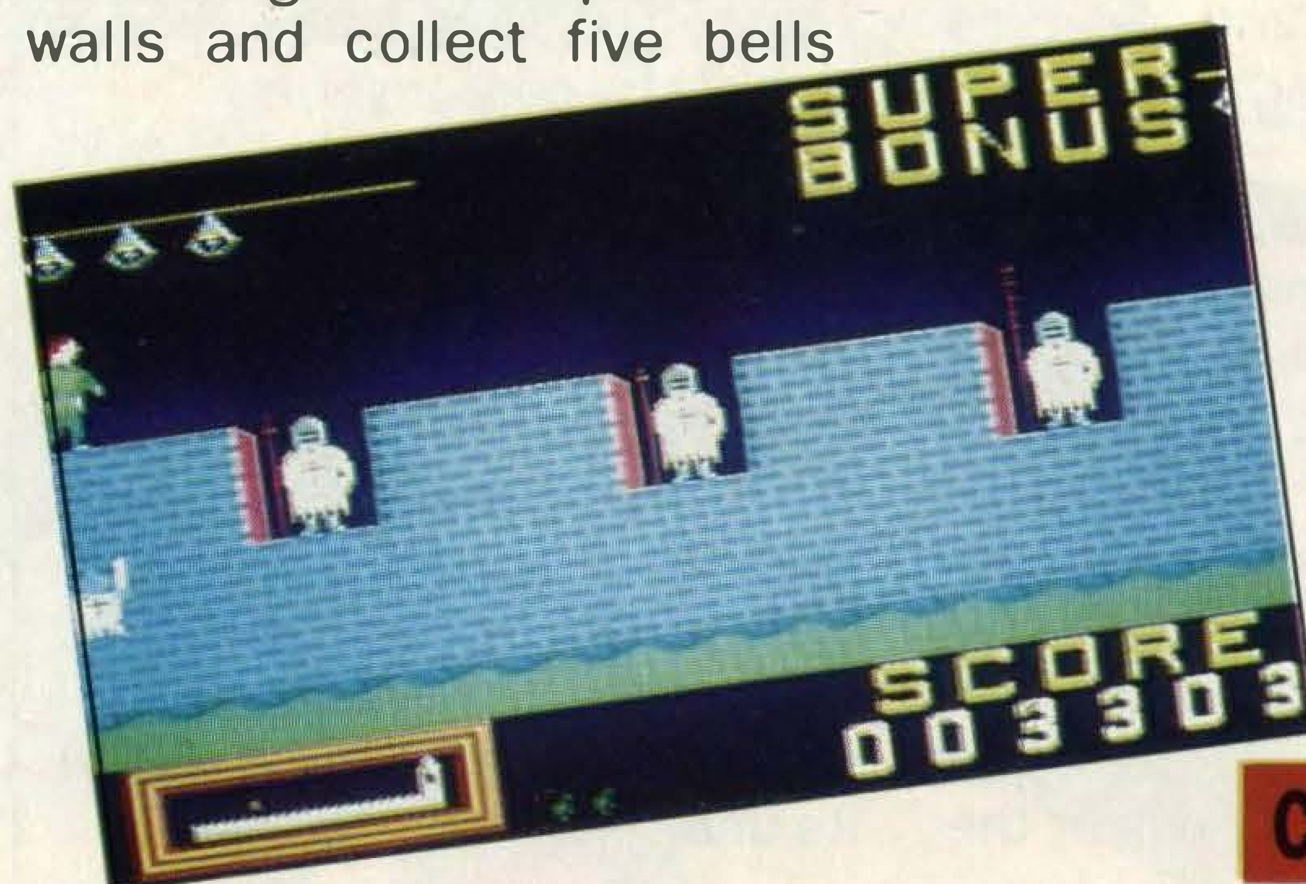
Quasimodo, dressed up in a bright apple green outfit, starts off the game by bounding along besides the castle wall to the tune of Teddy Bears' Picnic. The task in hand is to negotiate 14 walls and rescue the helpless female.

Burning cannon balls roll towards Quasimodo in the first screen and every time he completes a wall and rings a bell he gets an enormous amount of points. If Quasimodo manages to complete five walls and collect five bells without losing one of his three lives he gets a super bonus.

A time limit on each wall is provided by a guard dressed up in chain mail. He climbs up the wall at the beginning of each screen and stabs the hunchback in the back.

Fiendish obstacles on the walls include burning fireballs, arrows flying through the air as well as guards sticking spears up through gaps in the wall. In the higher levels everything happens at once.

The game will only operate with a joystick, but should appeal to all ages. It's a great game.




7

CASS: £6.90

## Ninja — by Kuma Computers

Iga the overlord has plans to conquer the entire country using his Ninja assassins and first on the hit list is the Kogan castle.

Your role in the game is to control one of these Ninja assassins, suitably outfitted in a red romper suit and armed with Syurikens (star shaped knives).

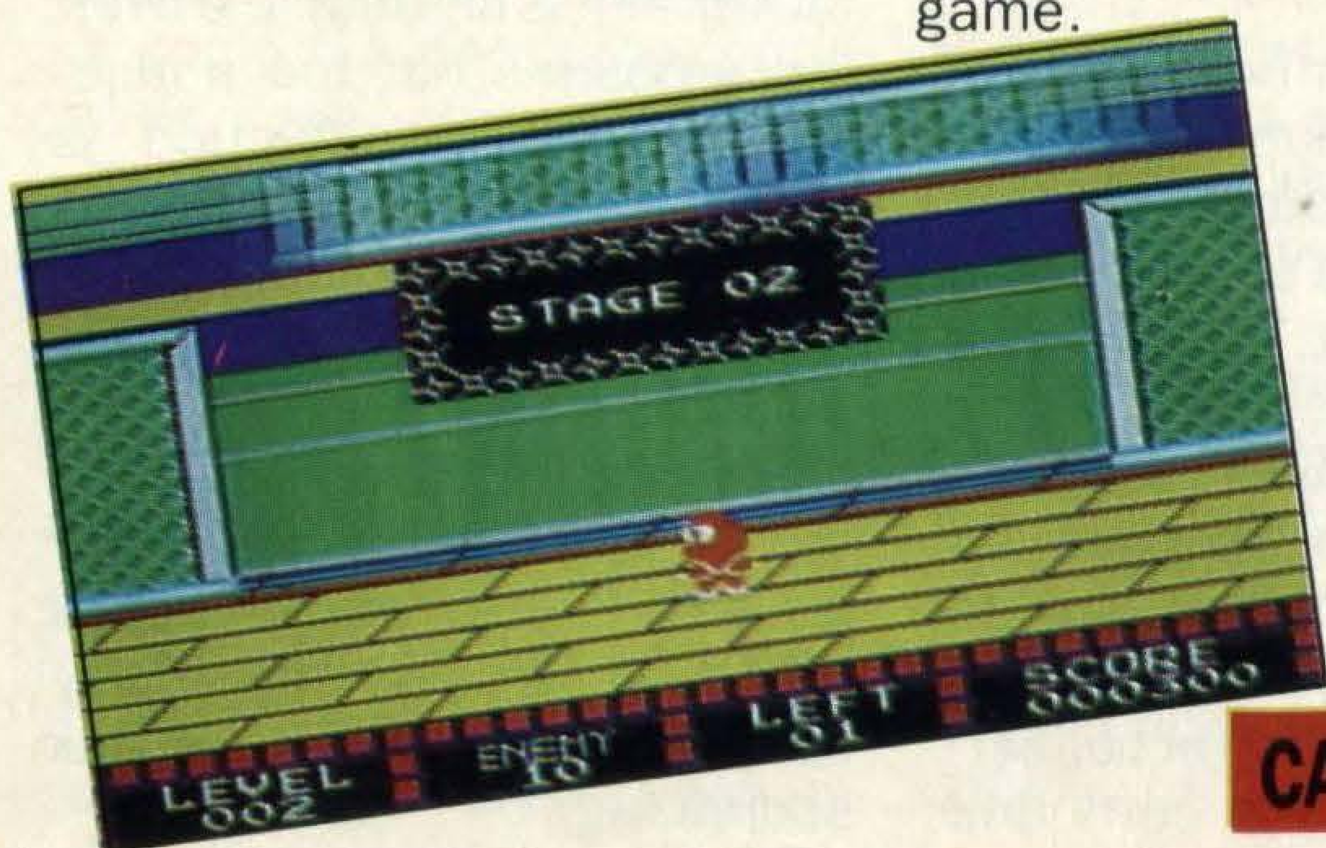
The action is divided between three locations; the outside, the inside and the top of the castle. As well as his knives, the Ninja has one other aide — Makimonocs or magical scrolls that lie around the castle and appear and disappear at random.

If opened, the scrolls endow you with magical powers. The magic disappears very quickly, but while it lasts it is very effective for fighting off the castle defenders.

The castle guards are a pretty efficient bunch and you will have to be extremely quick to dodge the spiked cannon balls, knives and various types of ammunition they throw at you while you're trying to chuck knives back.

Negotiating the first two levels was difficult but possible. The top of the castle is another matter!

The sound and graphic effects in Ninja are good, but a few more castle locations would have enhanced the game.




6

CASS: £6.95

## Spacewalk — by Mastertronic

CASS: £1.99

8




From the look of Spacewalk, you'd be excused for thinking it costs far more than £1.99. Value is a keynote.

Spacewalk has you controlling a spaceman whose task is to collect falling satellites and return them to a spaceship. Various obstacles moving across the screen must be either avoided or destroyed, and the satellite must be reached before it touches the ground. It's a simple enough idea.

Control is by either joystick or cursor control keys. The space bar/fire button serves another function besides blasting things — it lets you grab the spinning satellite.

Current and high scores are shown at the top of the screen. You can choose either to try and get through as many screens as you can (there are sixteen in all), or amass a high score by simply picking up the satellite and then holding it as you blast away at obstacles. Four lives are available, though if the satellite crashes, the game comes to an untimely end.

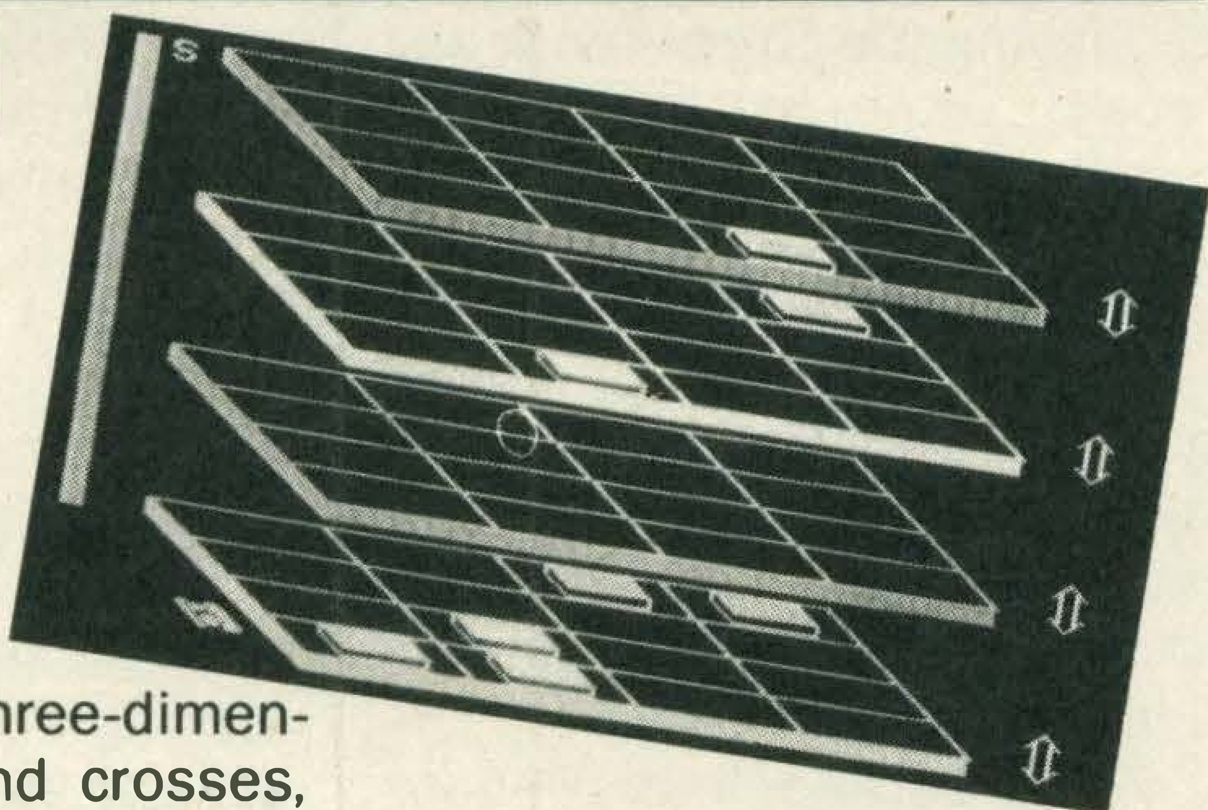
Sound and graphics are fair. The sprites are a bit samey, screen after screen, and the obstacles not very varied. They do pose a challenge though. Action is at a leisurely pace, with firing slower than you might like.

For £1.99, this is a bargain game but it won't give the same amount of entertainment as a good, normal price game.

## Cubit — by Mr Micro

CASS: £7.95

6



Cubit, a sort of three-dimensional noughts and crosses, offers confirmed arcade game addicts the chance to pit their mental skills rather than their reflexes against the computer.

The game's action takes place on four coloured grids which line themselves up on top of each other on screen. Each grid contains sixteen squares in a four by four formation.

You are given the chance to play against the computer, a formidable opponent, or a friend and you can choose to go either first or second.

The aim in this game of devious cunning is to place four counters in a straight line either horizontally, vertically or diagonally on the grids before the opponent does. If you are playing the computer you're going to need some sort of brilliant strategy because it always seems to win especially with the vertical lines, as they are difficult to see on the grids.

Either the keyboard or a joystick will move the counters round the board and every move is accompanied by high pitched bleeping sounds.

The lucky victor's winning line is covered with white counters and I WIN, YOU WIN or A WINNER is announced on the screen.

The computer can be beaten and once you've worked out the magic strategy, the game loses its charm. But until then Cubit is fun and extremely addictive.

## 737 Flight Simulator — by Mirrorsoft

Written by a real 737 pilot, this simulator strives for authenticity beyond all else. The result is a program that is understandably complex, and provides a great challenge to budding aviators.

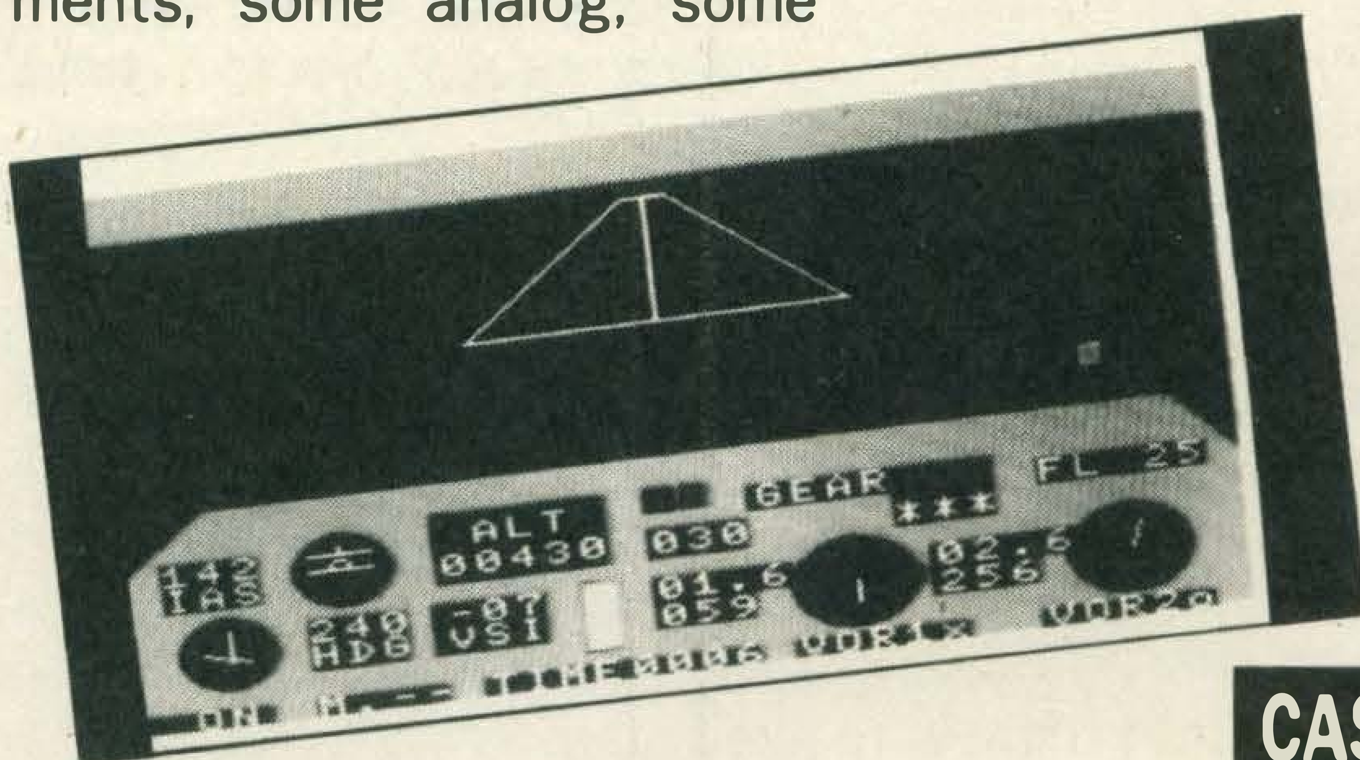
A lengthy manual guides you through the theory of flying and the controls. You'll need to study it, as there are 22 controls to master. Joystick is an option.

You can start at take-off, mid-flight or landing stages. Engine volume can be adjusted, and an input beep enabled. You can also alter the stall speed, wind direction, choose night flying or even design your own airfield. The display is of aircraft instruments, some analog, some digital. On take-off and landing the airstrip is visible. At other times you see a map of the airfield.

Take-off is quite simple. So is flying around. In fact these activities are pretty boring, accompanied as they are by only the drone of simulated engines. Landing is the tricky part, as you have to get the right approach speed, rate of descent and .centre on the runway. Audible alarms warn of danger.

Function keys are used to good effect, though one criticism is that response times to key commands are very slow.

As simulators go, this one is certainly realistic.




6

CASS: £9.95

## Stop the Express — by Mastertronic

All the best thrillers have a chase along the top of a speeding train. Stop the Express brings that excitement to MSX computers.

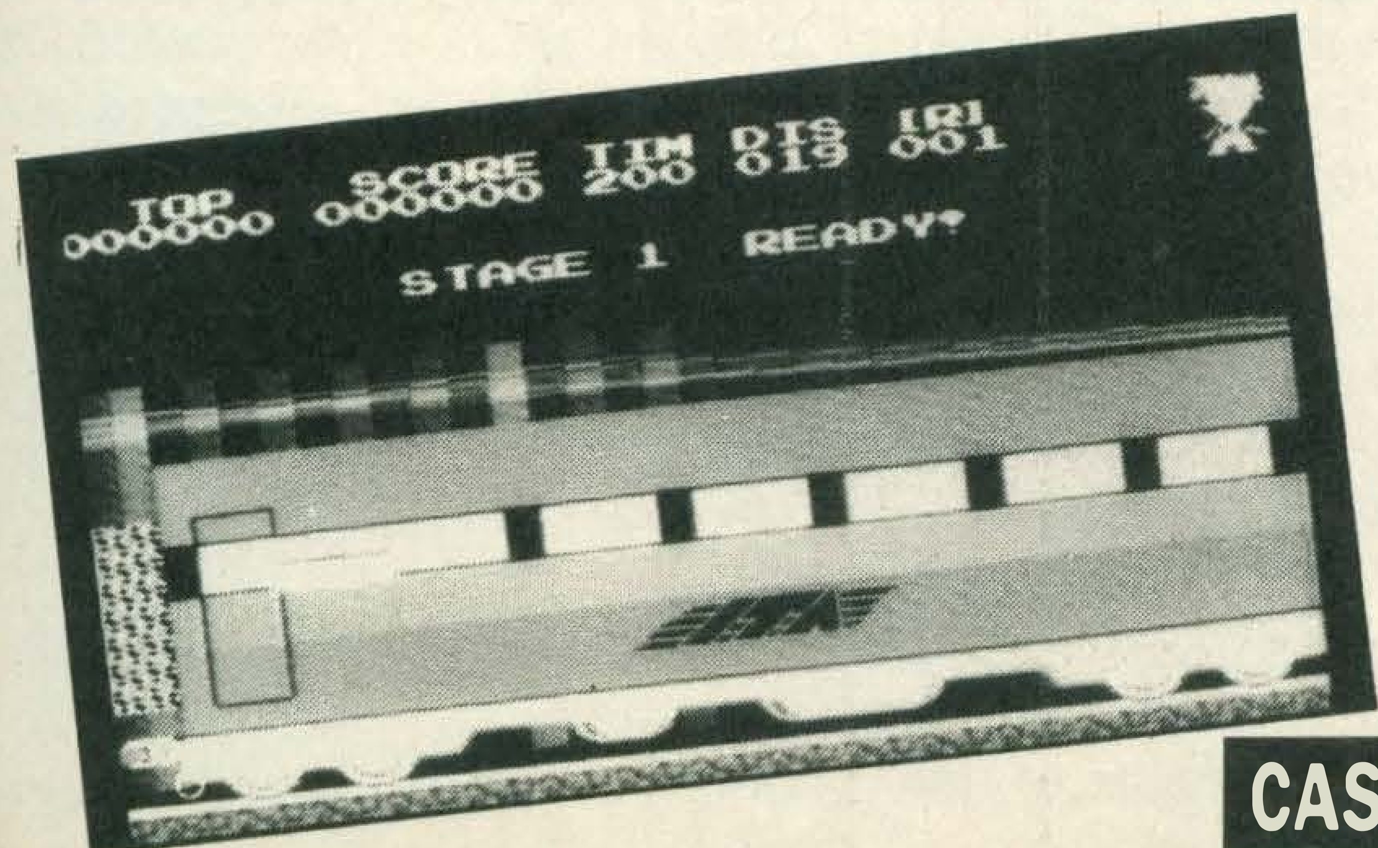
A man is dropped by helicopter onto the top of the speeding ITA Express. He has to run up to the front of the train within a given time limit. He can jump the gap between carriages, move forwards or backwards and lie down.

Lying down is essential if he is to avoid low railway signals and knives thrown by pursuing bandits.

Bandits emerge from carriages in pairs and chase the hero. He can run fast, duck or turn around and attempt to karate kick them off the train. He can also grab a 'snake bird' as it flies past, drop it behind him and leave it to see off the bandits. If he falls off or is caught, he tumbles ignominiously to the ground in a heap. You've three men to play with.

The sound effects revolve around the sound of a train. Graphics are colourful and chunky, in the Japanese style.

Mastering the game takes some doing. Fortunately events occur in the same pattern each time you play, so experience is a good teacher. However, once you get the knack, the game does lose some of its initial challenge.



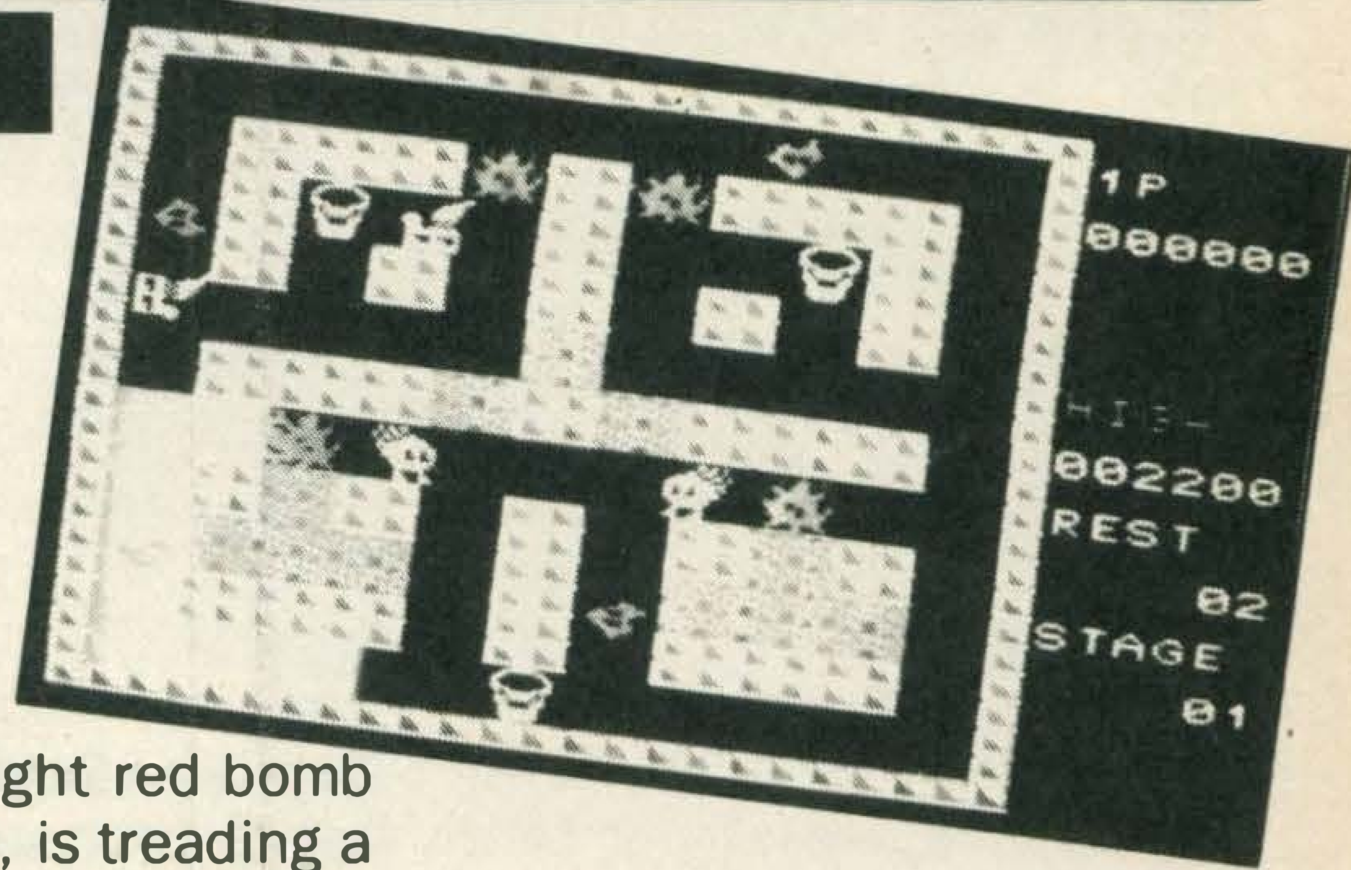

8

CASS: £6.95

## Sparkie — by Sony

CART: £18

7




Sparkie, a bright red bomb with a long fuse, is treading a dangerous path as he wanders round a lime green maze inhabited by little fires and sparks.

Your task is to guide Sparkie round each of the four maze formations using either a joystick or keyboard, incinerating everything in sight with his laser gun.

On the first level there are three fires in the maze. From these emerge little baby sparks which chase Sparkie round the corridors lighting his tail on contact.

Once the fuse starts to sizzle the only way Sparkie can save himself is to douse it in a bucket of water very quickly. If he's too late it's curtains for Sparkie. He has three opportunities to save himself.

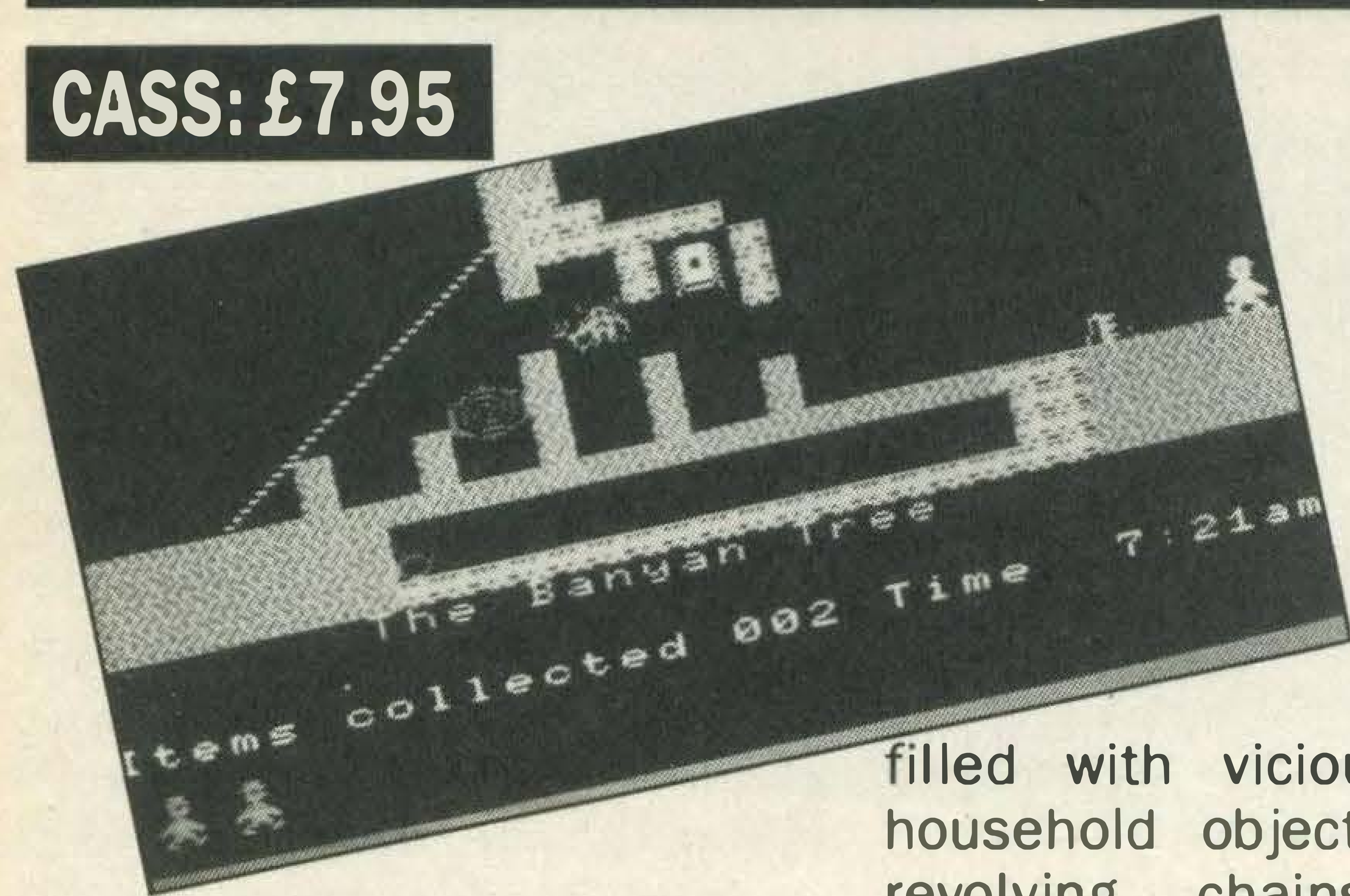
Occasionally part of the wall starts to glow red and orange signalling the arrival of a lighter. Bumping into one of these is fatal and Sparkie explodes with a resounding boom. Other deadly fiery enemies include mobile pink and purple flames.

Sparkie moves round accompanied by high pitched tink tink sounds and, once he has negotiated the increasingly difficult four levels, he goes back to the slightly faster first maze.

It's a great game — fast, exciting and very, very addictive to play.

## Jet Set Willy — by Software Projects

CASS: £7.95




8

Manic Willy is reaping the profits and has provided himself with a mansion and a retinue of fun loving friends.

His troubles start when Marie, his Italian housekeeper, finally rebels after yet another of his wild parties. The unruly guests have left bottles and glasses all over the house and she won't let him go to bed until he's cleared every last one. She stands in front of the bedroom tapping her foot just in case he tries to sneak in!

You have the task of guiding Willy round the house collecting the empties.

It sounds simple . . . but believe us it's not! Each room is filled with vicious ordinary household objects such as revolving chainsaws, and these kill Willy on contact.

He starts off in the bathroom, but his travels are not confined to the house. Locations include the Banyan Tree, and the Nightmare room where Willy turns into a flying pig! All the items he collects are totted up on the bottom of the screen.

Software Projects have incorporated a clever anti-piracy device using random colour codes and a complicated colour chart.

The combinations of humour, the number of locations and sheer deviousness of the game help to make it a brilliantly original and addictive game.

## Backgammon — by Electric Software

Playing the computer at any board game involving a bit more skill than luck is a challenge because the computer never makes mistakes.

A demonstration mode takes the first time player through the motions and the accompanying booklet sets out the rules of the game clearly and efficiently.

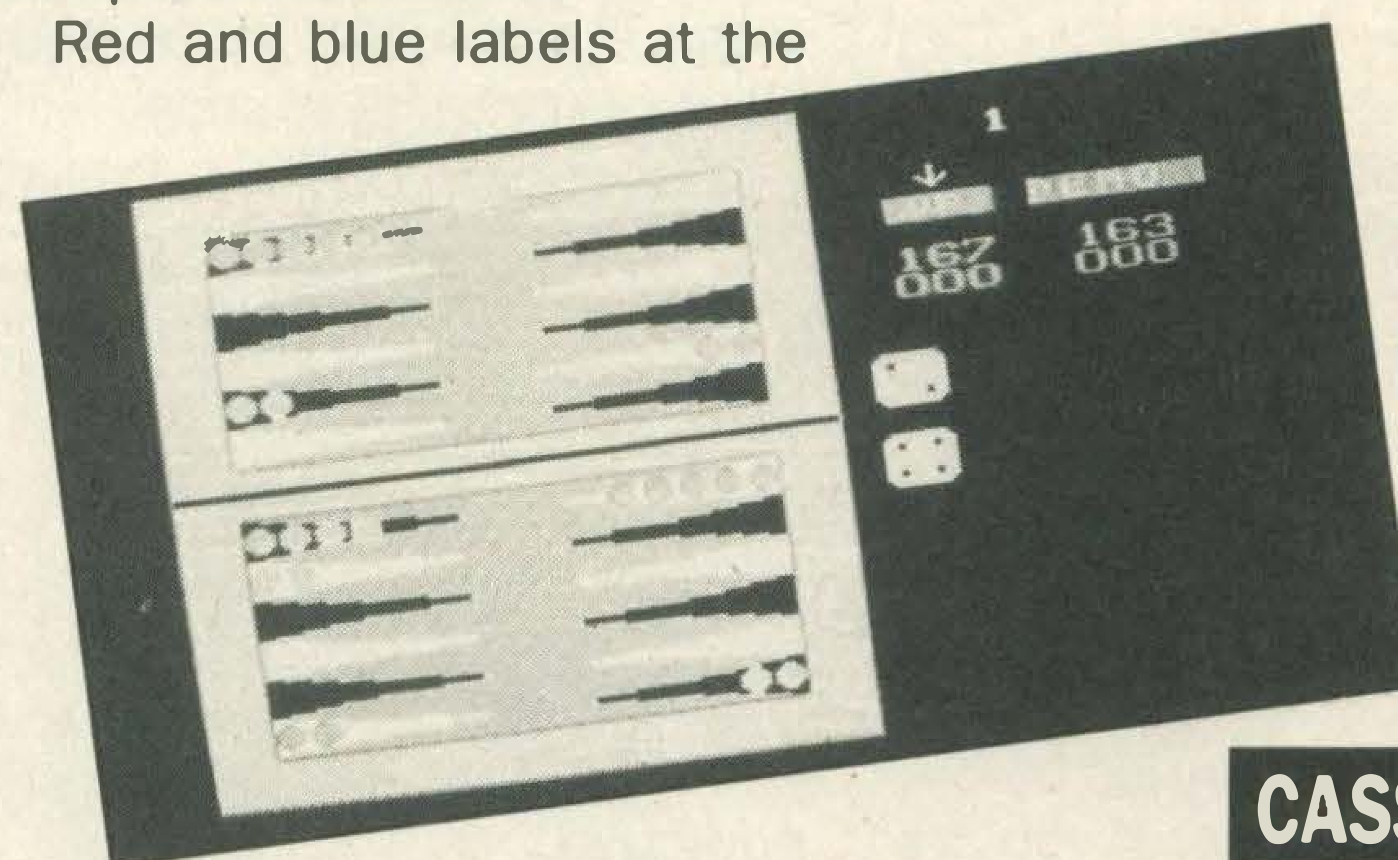
The Backgammon board appearing on the screen is placed with the two inner compartments at the bottom.

You play with the red counters and to decide who goes first the computer rolls a red and blue dice. If the blue dice's number is higher, then the computer moves first.

Red and blue labels at the side of the screen represent you and the computer. Underneath these are two three digit numbers. The upper one indicates the number the player needs to throw to move off the board. You have the option to play a set of up to 64 games.

Electric Software have added some realistic touches to this game such as a doubling dice. If you land on an opponents unguarded piece it is automatically placed in the middle.

This version of Backgammon is a faithful representation of the game and will give a Backgammon addict hours of pleasure.




8

CASS: £8.95

## Superchess — by Kuma Computers

Superchess isn't one of the most sophisticated chess programs on the market, but it is an adequate MSX version.

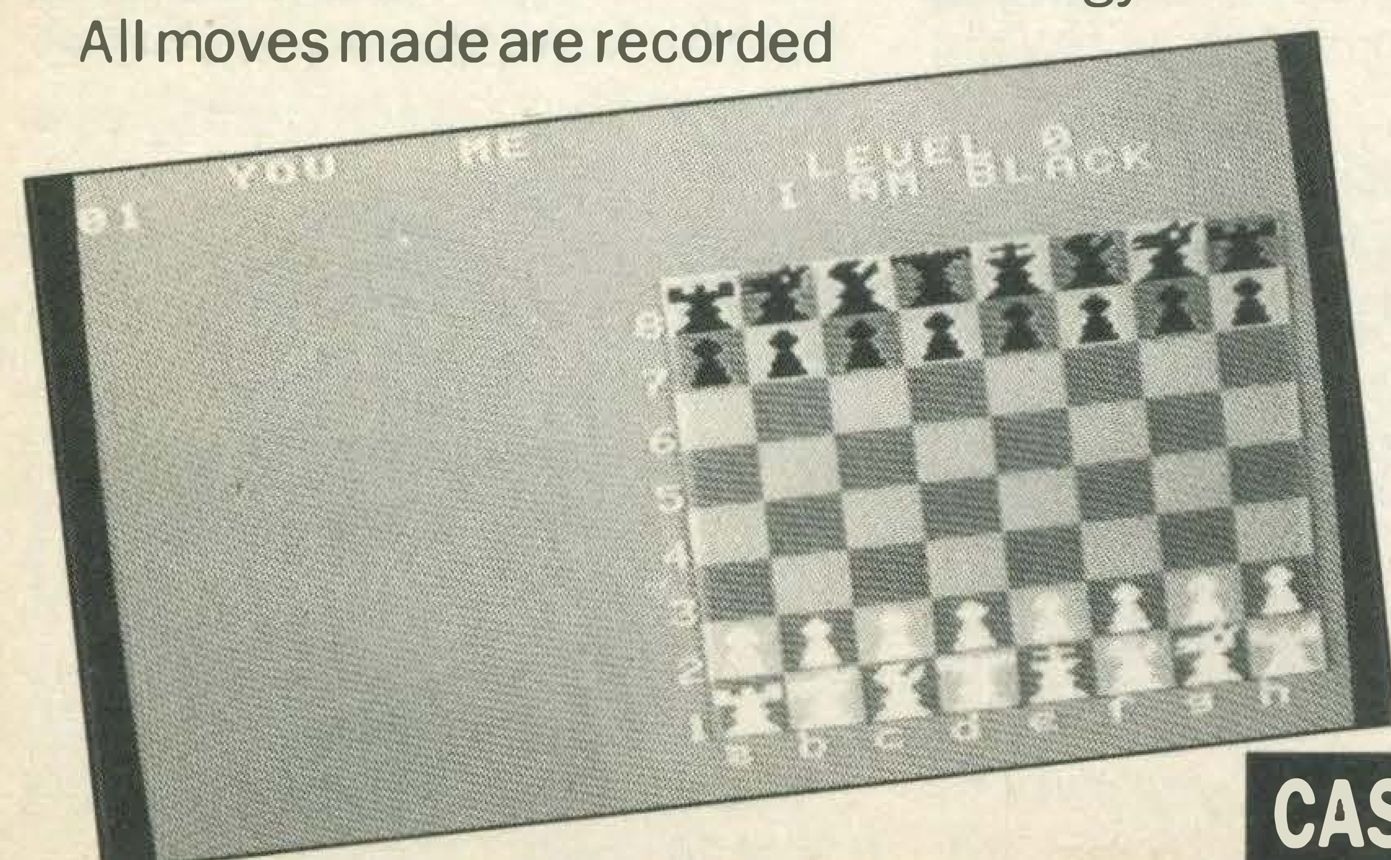
Seven levels of play difficulty are offered. The first five levels cater for the absolute beginners to the most dedicated players. The time it takes for the computer to respond with a move varies from about three seconds in the first level to thirty minutes in the fifth level.

The chess board is squashed onto one side of the screen and is a bit too small. The chess pieces are relatively well defined but are occasionally difficult to identify due to their diminutive size.

All moves made are recorded on the left hand side of the screen. Moves are made by typing in the co-ordinates and, if an impossible move is made, the program indicates this with ILLEGAL MOVE. CHECK or CHECK MATE are also shown.

If you are really stuck you can either ask the computer to move for you or ask it to recommend one. In the Analyse mode, the entire game can be transformed. Castling can be carried out in this mode.

Superchess gives the player a good game. It is simple to operate, but as the computer is such a logically accurate opponent, the only way you will win is to use a well thought out strategy.

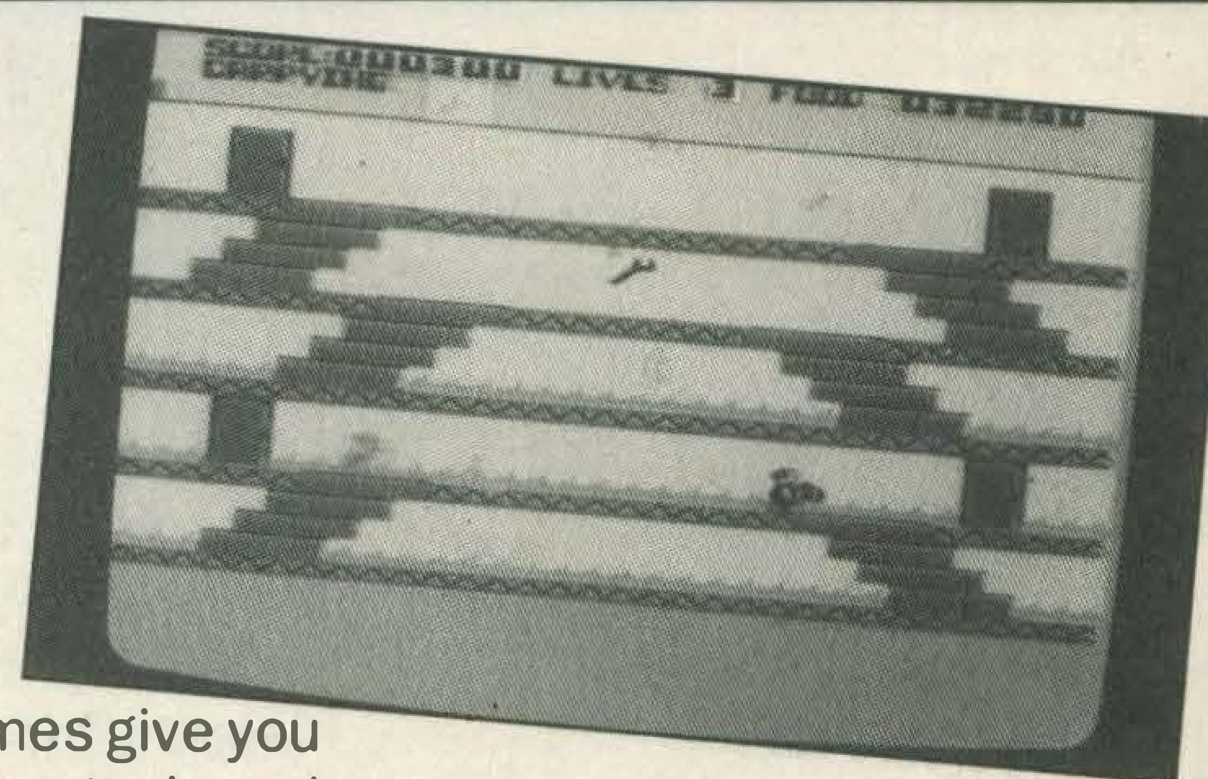



7

CASS: £6.95

## Les Flics — by PSS

CASS: £7.95




7

Most arcade games give you a clear idea of your task and how to achieve it. Les Flics, based on the Pink Panther adventures, tells you only that you must recover the Purple Puma diamond. All the characters you might expect to find are there — Inspector Clouseau and Kaolin the Chef, policemen and cars.

Life starts in a small town. You drive to one of nine buildings, avoiding police cars en route.

Enter a building and you find floors linked by stairs, ladders or elevators. Various objects such as daggers, food, money and so on are scattered about. Pressing the space bar or fire button picks them up. Then you have to figure out how to use them.

To get some objects, you'll need others, and you'll need everything to get the diamond. On top of that you must keep energy up by eating food, as well as keep pursuers at bay.

Points are scored for stopping policemen and collecting objects. You have three lives to play with.

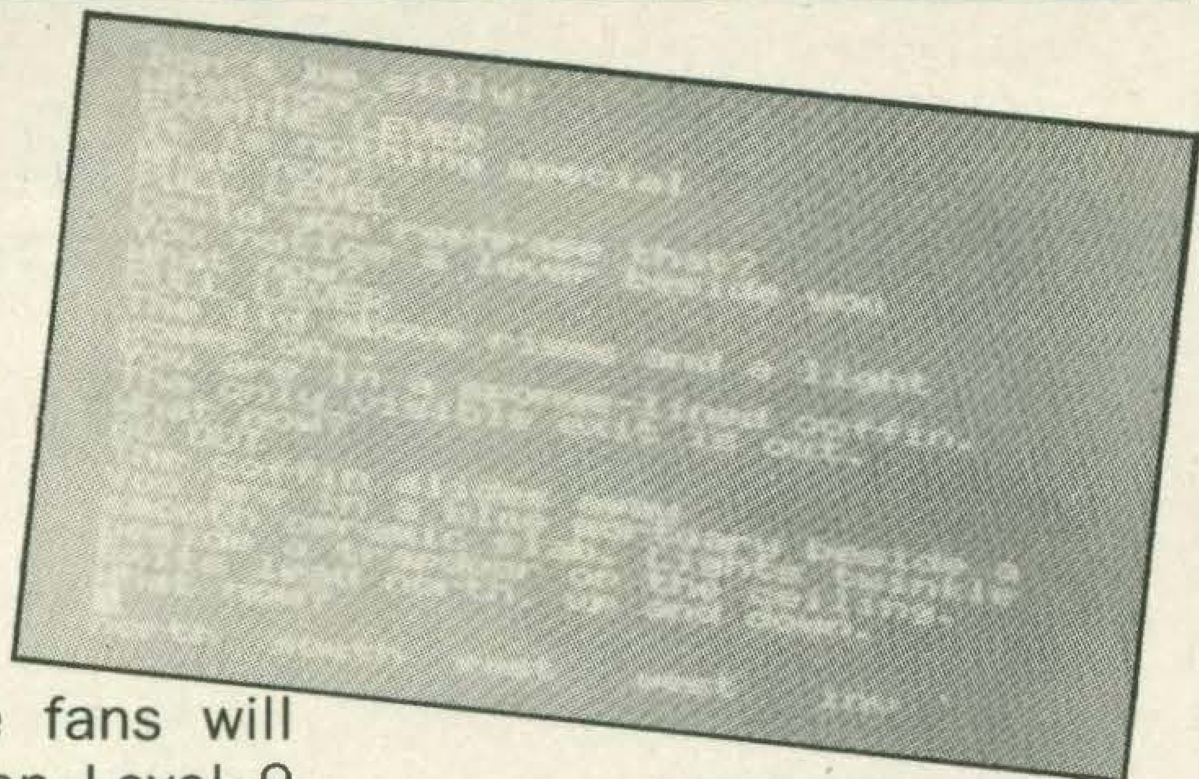
Graphics are restricted by the small size of the pieces, but colourful and varied. Sound is varied too, with police sirens, motors, walking noises and so forth. The game demonstrates if not played and has a pause facility.

Les Flics needs arcade skills and some planning to master. Once you get the hang of how to play, it's a real challenge.

## Snowball — by Level 9 Computing

CASS: £9.95

9



Adventure game fans will know the reputation Level 9 games have. Snowball is a science fiction adventure with, believe it or not, over 7000 locations to explore.

You play the role of Kim Kimberley. It's your task to save the mammoth starship Snowball 9. To do so you'll have to solve countless puzzles and extricate yourself from many a tricky situation.

This is a text only adventure — pictures would take up valuable memory. Location descriptions are detailed, so there's plenty for your imagination to work on. There's plenty of humour too.

Inventing 7000 locations is some achievement. To be fair, many are described in identical terms and there's no need to visit every location.

Once you get past some vicious nightingales it is comforting to learn that there are few vicious creatures around. You can survive quite easily. It is getting to other parts of the adventure that poses the problem. Everything you find has a use, but you'll need plenty of imagination to divine the use.

The game vocabulary is some 200 words, with the usual game save, restore and quit options. Handling of commands is very rapid indeed, thanks to some clever Machine Code programming. All in all, adventure games with a liking for science fiction plots will find Snowball hard to beat, and equally hard to solve.

## Special Operations — by Lothlorien

Described as a 'graphics adventure wargame', Special Operations has you in charge of a group of commandoes, trying to sabotage an Advanced Weapons Research Centre. It will keep strategists amused for hours.

There are three scenarios to explore — a forest, a compound and the complex itself. You move around these fields of play, exploring, finding useful objects or clues and fighting off patrolling guards.

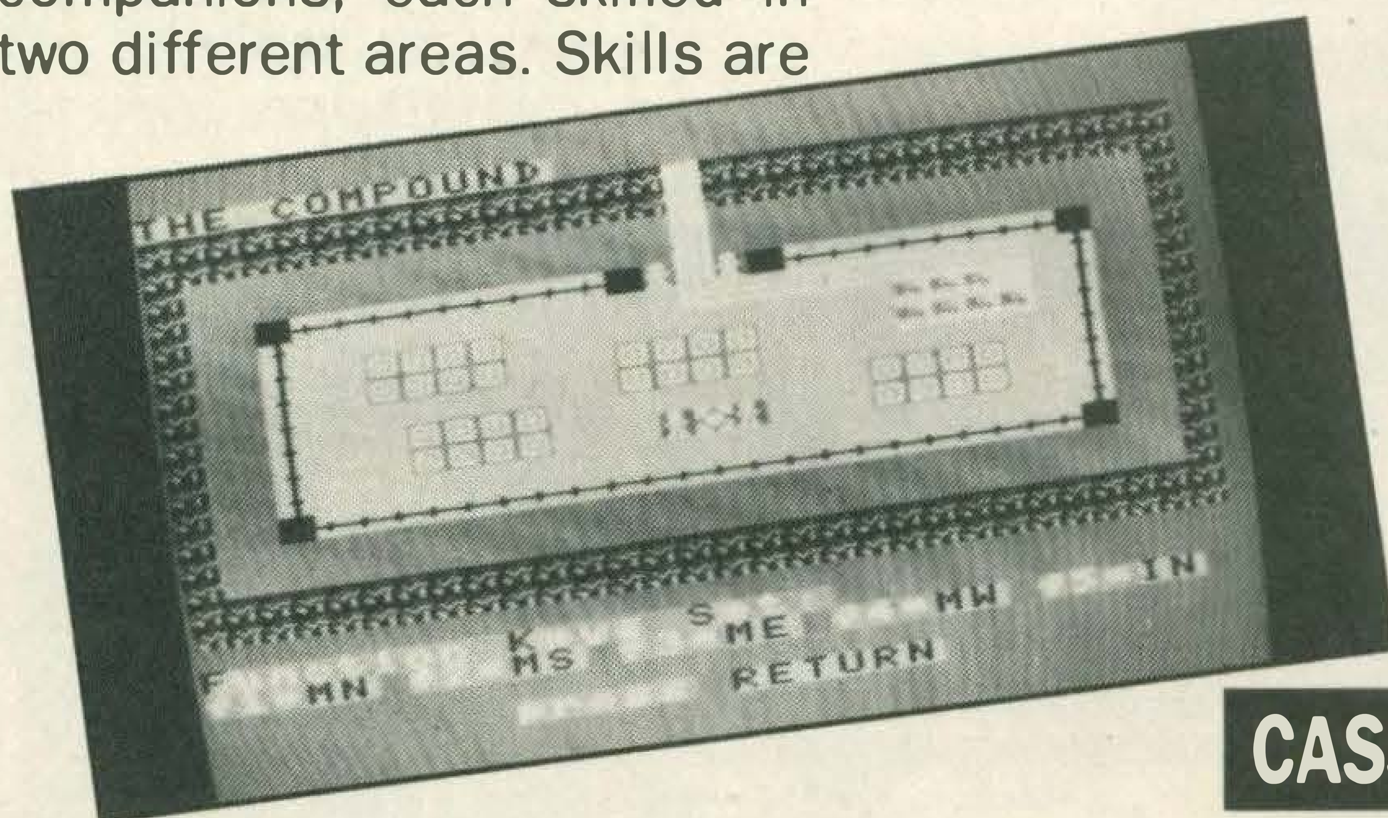
The game has seven goals, from the relatively easy to the downright impossible. You choose your goal and the time you need to achieve it. You then select a group of four companions, each skilled in two different areas. Skills are as diverse as those of an actor, a forger or a sniper.

With the right team, you explore the forest, its lakes, mines, pits and houses on a square map. Combat takes place on a larger scale map, man to man. Discover the compound and you'll have to work out how to get into it. At the end of the mission, you have to get back to a waiting aeroplane.

The graphics are blocklike and colourful. Little sound is used. There's no need to hurry either, as nothing happens until you key in a command.

This odd mix of adventure and strategy is certainly worth trying.

7




CASS: £6.95

## Let's Go MSX — by SoftCat

Learning to program in BASIC is not the easiest task in the world. Here's a set of four programs that will certainly help you on your way.

The tutorials are based around four programs — a simple cashplan, a book catalogue, a recipe finder and some simple mathematical games. More than tuition is on offer.

Each lesson follows a similar pattern. Key BASIC words can be listed and definitions summoned. A menu allows you to select different areas of the program, or to run the practical part of the program.

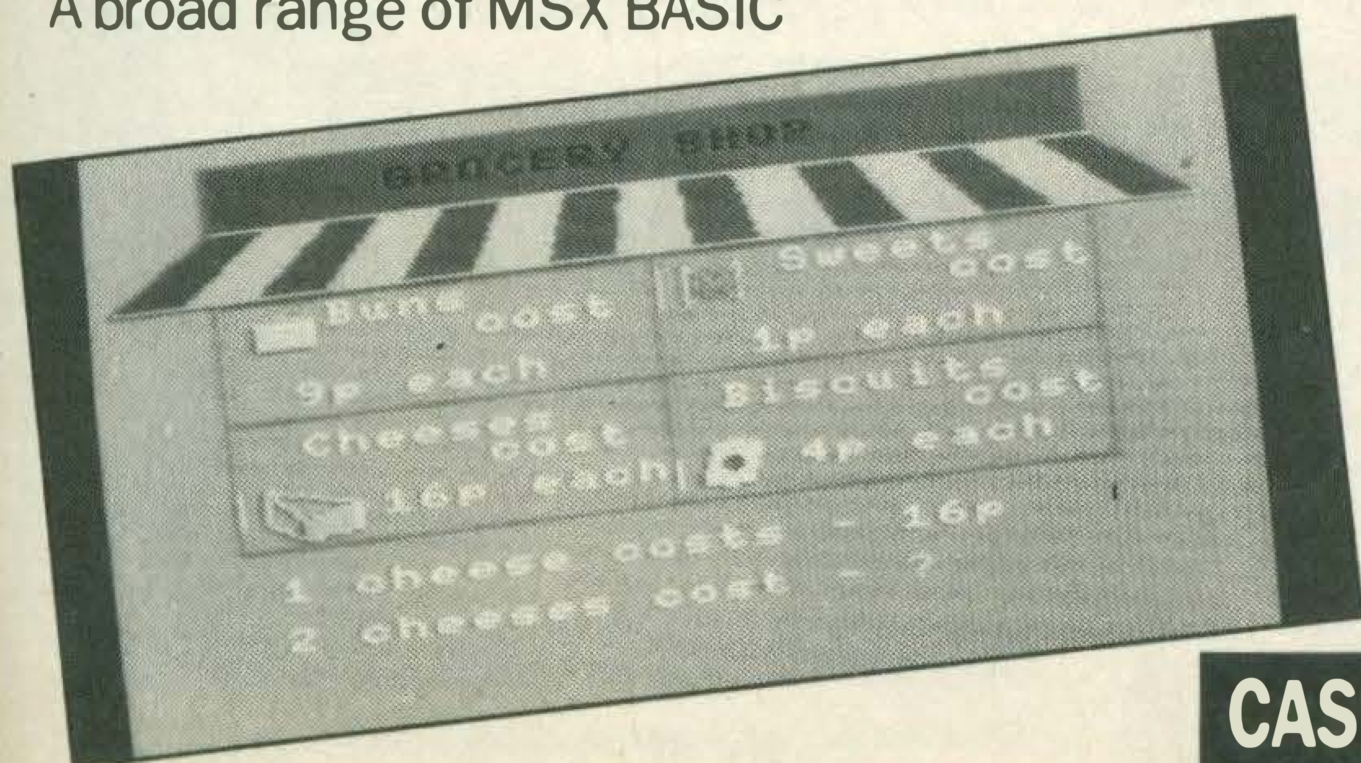
Being written in BASIC, loading is a lengthy business, and responses can be slow.

A broad range of MSX BASIC is covered. Subjects include variables, printing, arithmetic, graphics, text handling, sound, data and debugging programs.

Each command is explained at some length. A section of the program using the command may be shown too.

Function keys execute all commands. At any stage you can call up the main menu, the glossary of terms, continue or go back to the preceding screen. It is a very user friendly program.

The demonstration programs are in the main useful. If you wanted to learn BASIC, this quartet of programs will certainly help you on your way.



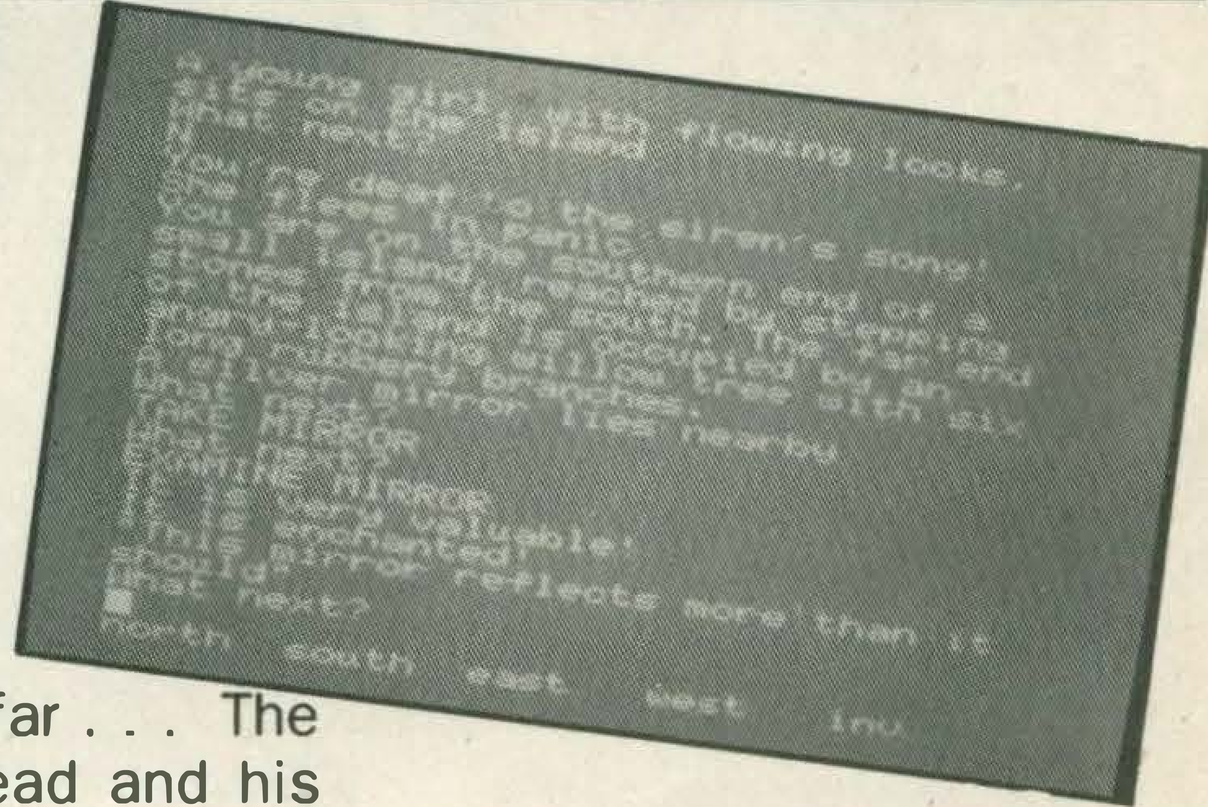

7

CASS: £9.95

## Dungeon Adventure — by Level 9 Computing

CASS: £9.95

9




The story so far . . . The demon Lord is dead and his vast store of treasures is still tucked away unguarded in the Northern Black Tower just waiting for a person like yourself to go and rescue it.

Sounds a fairly simple task, but unfortunately you wake up by a river, hours later, cold, damp and unarmed. Now your troubles really begin!

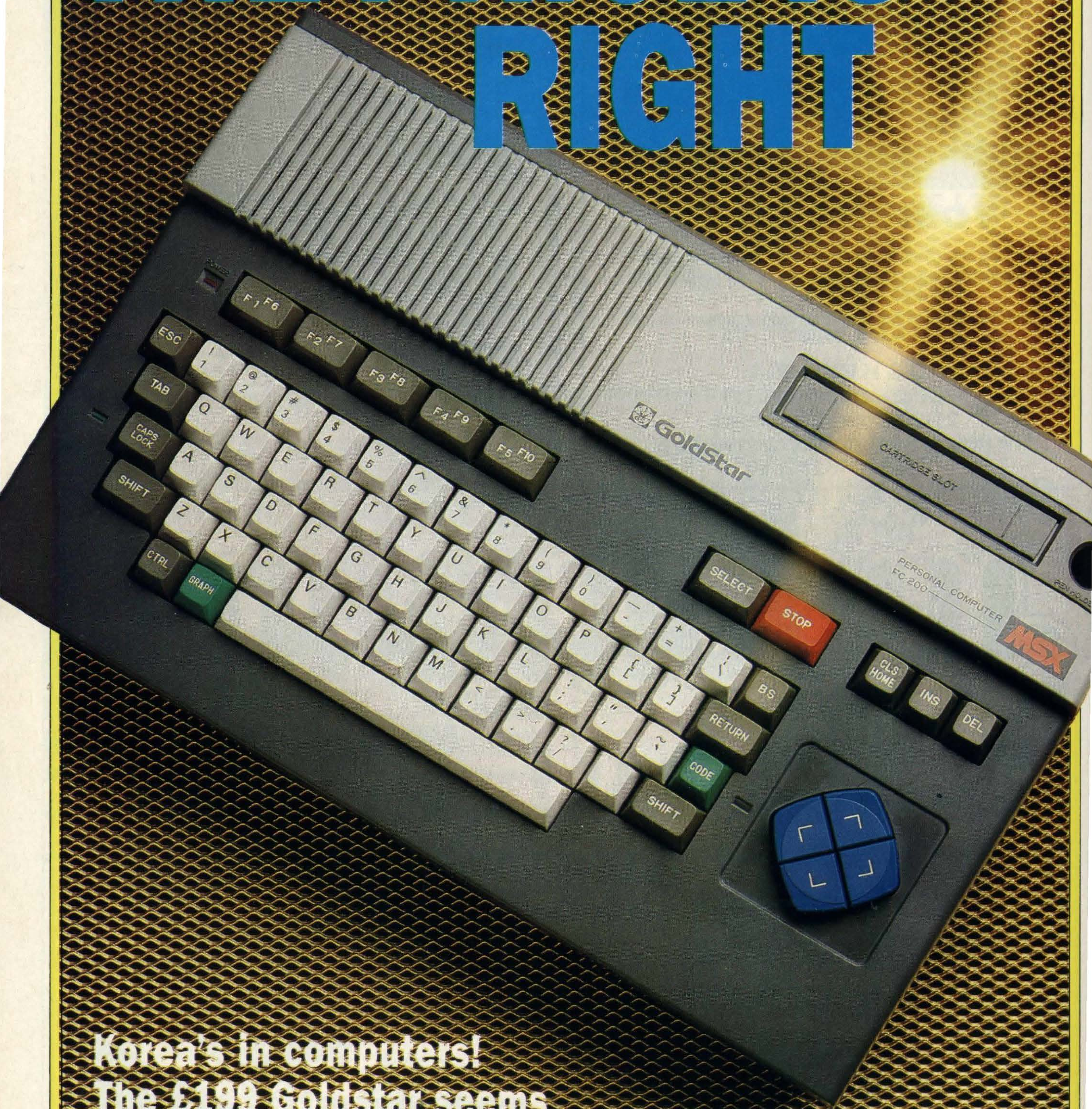
Level 9, in keeping with their excellent adventure standards have created a totally gripping, and at times extremely annoying adventure game. Your imagination and inventiveness are tested to the full as you wander through the nooks and crannies of the Demon Lord's old hideout.

To succeed with your quest you will have to retain a sense of humour because time and time again you'll find yourself attacked by globs of carnivorous jelly, armed skeletons and other ghoulish nasties.

As you wander around you come across seemingly innocuous objects and creatures such as grotesque bloated yellow birds with big ears, sickeningly cute octopii and corpses. Most of these things do have a purpose and if used correctly will help solve clues.

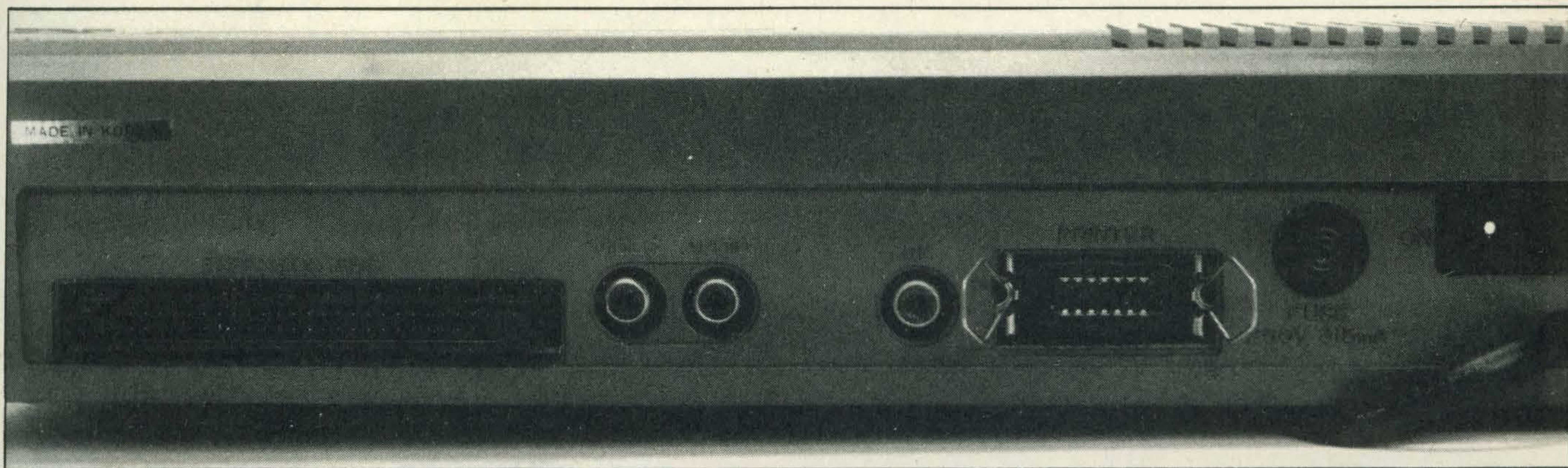
Don't expect to solve this adventure in a day. It will take weeks even months to complete. The demon Lord has been jolly crafty guarding his treasures and you'll need both luck and ingenuity to collect the objects.

# THE PRICE IS RIGHT




**Korea's in computers! The £199 Goldstar seems real value for money**

**GOLDSTAR FC-200** **£199.99**




Goldstar's rear holds the usual array of sockets and plugs. Note the old fashioned 50 pin expansion bus and the Centronics printer port

**Although the Goldstar company, producers of the Goldstar FC-200 are not as familiar to us as some of the other MSX manufacturers such as Yamaha, Toshiba and Canon, they are a huge and well established Korean company.**

They specialise in electrical goods such as fridges, freezers and hi-fi and 1984's annual profits come close to seven billion dollars. The company's influence and importance in Korean is such that their contribution to the Korean economy makes up about 10 to 20 per cent of the countries gross national product!

With such an impressive sales record at home it was surely only a matter of time before Goldstar started producing home computers. The obvious design to use was the established MSX standard already accepted by many of the giant Japanese corporations — Sony, Sanyo and Mitsubishi to name a few. As an added bonus the development costs would be kept to an absolute minimum since someone else had done all the hardwork! All Goldstar had to do was pay a licence fee and build the computers.

Unlike most of the other MSX computers in Britain, the FC-200 is not sold in this country by its original manufacturers, but by Microdealer, a British distribution company. When they heard that Goldstar were planning to manufacture MSX machines, they flew over to Korea and expressed keen interest in selling Goldstar's computer to the British.

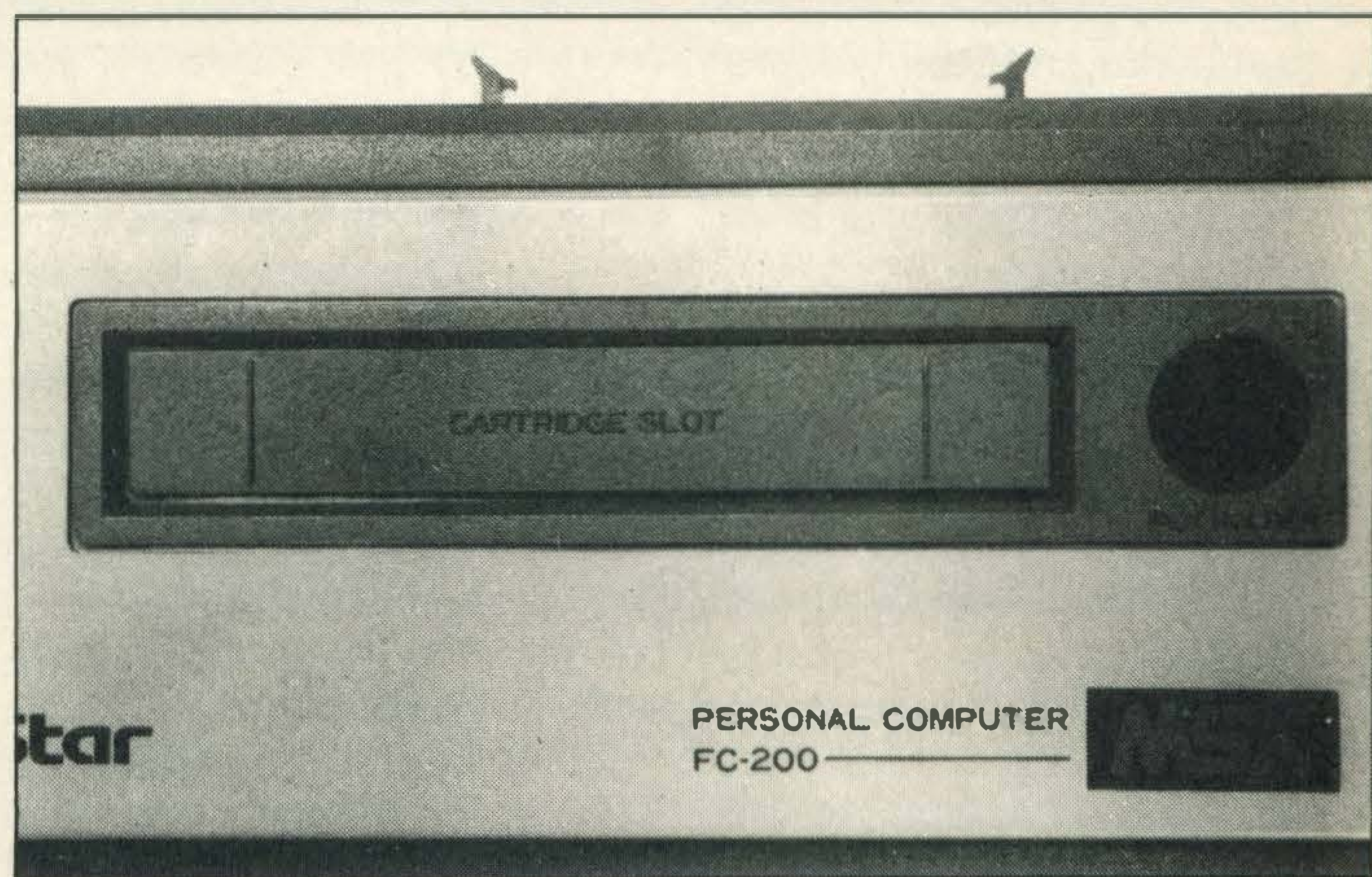
Most of the Japanese companies have developed peripherals such as joysticks, printers and disk drives as well as software for their machines. Goldstar decided not to follow suit at least for the British market. They reckoned that Britain's own peripheral and software manufacturers would be much better qualified to know what the public in their own country wanted.

The FC-200's most outstanding feature is of course its present £199 price tag. It has always been the least expensive MSX computer and over Christmas the price was lowered from the original £239 to the current £199. It's an incredibly low price, when you consider that the Sony and Sanyo MSX computers are still retailing at £300 and on paper have virtually the same features as the Goldstar.

However, prices are falling in Japan too and a Goldstar spokesman confidently expected that we would soon see MSX prices around £150, albeit at the cost of the user memory. For instance a Casio MSX computer is currently selling for £80 in Tokyo, although it only has 4K memory and a calculator-type membrane keyboard.

Another important factor in future price reductions is integrating the chips. Kay Nishi, founder of ASCII Microsoft, revealed in December 1984 that they were working on a VLSI (Very Large Scale Integration) chips for the MSX. So, by summer 1985 we may see all the MSX's selling at very competitive prices because one large chip is less expensive to make and install then several small ones!

That's for the future. At the moment, the British public still demands a 64K machine such as the FC-200. Although the Goldstar may lack the panache and dash of some of the other more expensive MSX computers, is that enough to justify the wide price difference between the Goldstar and MSX computers costing £100 more?




The sprung flap protecting the cartridge port resets the Goldstar

Dudley Langmead, Microdealer's Director of Operations, confessed that when they first announced the price they were rather worried about the difference between the price of their machine and the other MSX's. Like many other people they wondered whether it could be anything to do with inferior quality.

We have inspected the FC-200 carefully to see if quality is significantly different from the more expensive models, or even the Toshiba which, at £239, is the nearest competitor in terms of price. But consider some of the other possible reasons for the price tag.

A significant factor is that the Goldstar company is not part of the Japanese MSX industry, which, while developing and advertising the MSX standard, spent enormous amounts of money and is still recovering the costs. Korean labour costs are much lower than those in Japan and the American dollar is playing its part in keeping Japanese machine prices up. These reasons are reinforced by the fact that Dai Woo, another Korean company, will be releasing the Network NW200 in spring for £199, exactly the same price as the Goldstar.

Accompanying the FC-200 are two cables: the RF and cassette cables, two manuals: operating and MSX BASIC and two cassettes: a demonstration tape and Hoovermania, a game from PSS.

While subtle good looks are definitely not the Goldstar's best feature, it certainly isn't unpleasant to look at. It is one of the larger MSX models with a two tone grey casing. The corners are nicely rounded and although the paint finish was starting to wear off on our model, that was no doubt because it has been in constant daily use for the past four months. Four rubbery feet are enough to prevent it slipping all over a shiny desk surface.

There are 73 keys altogether, 48 alphanumeric, 21 control keys and the four cursor keys. The FC-200 wins 'the most colourful MSX' prize with the number of colours it has incorporated into the keyboard. The alphanumeric keys are off-white with black



lettering and the function keys are dark grey with white lettering.

The cursor keys are bright blue and occupy a large area to the left of the alphanumeric keys, easily within reach of the typist's fingers. Although not ideal for games playing due to their relatively small size they are adequate. The STOP key is bright red and the CODE and GRAPH keys are both vivid green.

The colour coding is useful especially when programming and anyone unfamiliar with a keyboard will find the colouring a useful feature. Newcomers find it so easy to press the wrong keys yielding irritating time consuming mistakes.

Not content with the coloured keys, Goldstar have also incorporated some useful red and green LED lights to indicate when a function is in operation. For instance, a red light indicates when the computer is on.

The keyboard slopes down and although the keys feel spongy and click loudly when pressed you soon get used to them. The keys are in the familiar QWERTY configuration and are excellent for word processing as they have a slightly rough surface preventing fingers from slipping off.

A lot of thought has gone into the design of the keyboard. Apart from colouring certain vital keys, the function keys are situated along the top and easily accessed when programming or playing games that use them.

Some aspects of the keyboard could be improved. For a start there is no £ sign, but there is a $ sign! Come on Goldstar, everyone knows that the British use pound notes not dollars!

There is a blank key on the lower right hand corner of the keyboard and if this is pressed with the GRAPH, CODE and CONTROL keys European accents will appear on screen.

The RETURN key is too small. On some of the MSX's, the RETURN key is the dominant feature as it is important for programming, word processing and playing some games with. On the FC-200 it's the same size as the SHIFT and function keys. The '+' sign, an important one for programmers is thoughtlessly placed in upper case mode. It would have made more sense to have swopped it with a less vital sign situated in a lower case position.

A RESET key would have been useful, but if you press the cartridge flap in, the machine resets itself. We found this out to our cost when we accidently pressed the flap with a day's worth of word processing on the screen! (Resetting it causes the title screen to appear and all previous information in the user RAM to disappear.)

Despite a few criticisms, the FC-200 keyboard is functional and just as good as some of the more expensive machines.

The back of the computer holds the usual array of ports and sockets plus an interesting extra, a little plastic plug through which a new fuse can be fitted without opening the machine up.

Going from right to left at the back, the first interface is the 50 pin expansion bus. Although it has the same number of pins as the cartridge slot, cartridges won't fit into it.



The accessories supplied with the Goldstar


Two joystick ports and the cassette port are positioned on the right side

Most of the add ons using the 50 pin interface are fitted with cartridge-type connectors including the Sony HBD-50 diskdrive, the Sanyo lightpen and all the memory extending RAM packs. None of these would fit into the 50 pin expansion bus.

If a user wanted to expand his FC-200's memory as well as use the lightpen he or she would be at a loss because there aren't enough compatible expansion slots! Most other companies have sensibly dispensed with the old-fashioned expansion bus and recent micros have two cartridge ports.

Next to the expansion bus are three phono sockets; video, audio and RF. If you are intending to purchase a monitor, it is worth remembering that the FC-200 will only send signals to a composite video (PAL) monitor and not an RGB monitor. Another point to keep in mind is that if you intend to use a monitor with a BNC socket you will have to purchase a separate cable because only the RF cable, suitable for most televisions is included with the FC-200. Panasonic are the only firm to date to include the BNC cables with their computers.

Next to the RF socket is the Centronics printer port, the fuse plug, an ON/OFF rocker switch and last but not least the permanently attached power cable.

On the right side of the computer is an 8 pin DIN cassette port plus two joystick sockets, an essential requirement if you plan to use the computer for games, as some of them have a two player facility. All of these interfaces are clearly labelled so even the most absent minded person would find if difficult to plug the wrong cable in.

Above the keyboard panel is the cartridge slot complete with sprung flap protecting the insides from potentially damaging dust and other foreign bodies. By the side is a lightpen holder, a deep hole for the pen to slot into. Unfortunately when we tried the Sanyo lightpen, the only one available in Britain at the moment, it was quite difficult to operate. We asked Goldstar what the problem was and were told that it seemed to be because the Sanyo's cartridge connector didn't quite fit properly into the FC-200's cartridge slot. This could be due to a piece of plastic sticking out, but if you want to use a lightpen with your Goldstar, it might be a good idea to check whether the machine you are buying will work with the pen.

So much for the interfaces. The FC-200 has everything the others have plus a few extras. Maybe the insides hold some clue to the low price.

It is well held together with six screws. The computer's innards are all neatly arranged on PCBs and held securely to the base with more screws. The largest PCB holds all the main chips including the Z80 CPU, video and sound chips.

After a hard days word processing, the FC-200 tends to get extremely hot despite the grills liberally sprinkled on and under the computer.

The operating manual accompanying the computer is a detailed and interesting booklet full of cartoons and illustrations. It assumes that the buyer is a first time user and explains everything; from connecting the various peripherals, monitors and data recorder, the rudiments of programming in MSX BASIC and the functions of all the keys. The other manual on MSX BASIC explains what the main language specifications for MSX BASIC are and goes into details about the main command statements and functions of the language.

Hoovermania, the token piece of games software is not world shattering, but it is a playable maze game involving a hoover, broomsticks and rubbish. Toshiba and Mitsubishi are starting a welcome trend by including high quality software with their computers. For instance Toshiba includes three games worth £20 with their HX-10. With competition like that, Microdealer might have to consider including more software with their machine!

## LIKES

- Low price
- Coloured keys
- Usable keyboard

Squares, circles and various geometric designs in red, blue and yellow are displayed on the demonstration tape together with some of the machines specifications.

So far we have failed to find anything to explain the Goldstar's seemingly unrealistic price. What about the sound and graphics. Well we've played dozens of games on both cassette and cartridge and have never noticed any difference between their performances on the FC-200 and that on any of the pricier MSX's. Both the graphics and sound capabilities of MSX are excellent and games like Antarctic Adventure from Konami fully demonstrate these qualities.

## DISLIKES

- Plasticy feel
- Return key
- Expansion bus

Apart from testing the Goldstar with numerous games we have used joysticks of every description and none of them have ever failed to work. We've used countless data recorders to both load and save programs, and again we can report no failures. Even the Sony disk drive, the HBD-50, worked smoothly. We couldn't find any inferior operational qualities to explain why it is the lowest priced MSX in Britain.

As Dudley Langmead told us, the Goldstar FC-200 is not attempting to win any 'Computer Design of the Year' awards, but sets out only to fulfil the basic MSX requirements as cheaply and efficiently as possible. We think it does!




The keyboard is perfect for word processing. Programming is aided by colour-coded keys and LED lights

The more expensive MSX's, the Sony, Sanyo, Canon and so on, although cosmetically superior cannot claim technical superiority.

At £225, the 32K Mitsubishi is more expensive than the Goldstar although it has less user memory, but does include £40 worth of software which gives it an effective price below that of the Goldstar. But it does have its restrictions. For example it won't load The Hobbit (an adventure game using up a lot of memory).

Goldstar's nearest true competitor is the Toshiba HX-10 which at £239 together with its £20 of software is just behind the FC-200 especially as it is very similar in appearance. The Network, when it is released will also be a strong competitor as it is the same price. If they decide to include decent software, Goldstar will have to act quickly as otherwise they may find themselves usurped from their advantagous position.

Only massive price cuts by Japanese rivals will threaten the Goldstar, and it may then get cheaper in response.

## Verdict

**As a family computer which is going to get knocked around, have tea and biscuit crumbs dropped down it (we know it stands up to this ultimate test from experience!) the emphasis is on value for money and durability and you will find no better bargain than the Goldstar FC-200.**

## GOLDSTAR FC-200 £199

### SPECIFICATION

| | |
|---|---|
| **CPU** | Z-80A equivalent (3.6MHz clock) |
| **MEMORY** | |
| RAM | 64K |
| ROM | 32K MSX BASIC |
| VIDEO RAM | 16K |
| **KEYBOARD** | |
| TYPE | Full travel |
| KEYS | 48 Alphanumeric<br>21 control keys<br>Keypad cursor control |
| NUMERIC KEYPAD | No |
| **VIDEO DISPLAY** | |
| TEXT | 40 characters × 24 lines |
| GRAPHICS | Maximum resolution 256 × 192 pixel |
| COLOURS | 16 |
| SPRITES | 32 |
| OUTPUT | TV<br>Monitor |
| **SOUND** | |
| GENERATOR | 3 channel with 8 octave range |
| OUTPUTS | Mono audio output (RCA phono)<br>150mV/10kOhm<br>Standard |
| **INTERFACES** | |
| JOYSTICKS | 2 Atari standard |
| EXPANSION BUS | ⊥ |
| CARTRIDGE PORT | 2 |
| PRINTER | 1 × Centronics |
| SERIAL PORT | No |
| CASSETTE | 8-pin DIN |
| RESET | No |
| DIMENSIONS | 400 × 260 × 63 (W×D×H) |
| WEIGHT | 4.7kg |
| POWER SUPPLY | Internal, captive mains lead |
| FINISH | Two-tone grey plastic case, off-white keys with black lettering. Colour cursor, stop, code and graph keys |
| SOFTWARE INCLUDED | 1 Vacuumania game<br>demonstration program |
| SUPPLIED ACCESSORIES | 1 RF cable<br>1 cassette cable<br>Operating manual<br>MSX Basic manual |
| DISTRIBUTOR | Microdealer UK) Ltd<br>29 Burrowfields<br>Welwyn Garden City<br>Herts AL7 4SS<br>Tel: (07073) 28181 |





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CX5M
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- Auto-accompaniment with rhythm
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  - FM Music Composer
  - FM Voicing Program
  - DX7 Voicing Program (Coming Soon)
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Gigsounds, 22 Rushey Green, SE6
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Rose-Morris, 11 Denmark St, WC2
Soho Soundhouse, 18a Soho Sq, W1
Syco Systems, 20 Conduit Pl, W2
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**Barnet:** ESS, 230 High St
**Belfast:** Baird Sound Systems, 208 York St
**Bingley:** JSG Music, 104 Main St
**Birmingham:** Jones & Crossland, 6 Smallbrook Queensway
Musical Exchange, 89 Old Snow Hill
**Blackburn:** Reidy's, 9-13 Penny St
**Bournemouth:** Eddie Moors Music, 679 Christchurch Rd
**Bristol:** Bristol Guitar Workshop, 157 St Michael's Hill
London Rock Shop, 7 Union St
**Cambridge:** Cambridge Rock, 8 Burleigh St
**Cardiff:** Musicland, 148-154 North Rd
**Chelmsford:** Future Music, 10 Baddow Rd
**Colchester:** Axe Music, 96 High St
**Croydon:** Rockbottom, 74 London Rd
**Derby:** Derby Organ Centre 62 Babbington Lane
**Dunfermline:** Sound Control, Elgin St
**Eastbourne:** Peter Bonner, 12a Grove Rd
**Edinburgh:** James Grant 53 Home St
**Exeter:** City Music, 4 Stn. Cres, Queen st
**Fleet:** Kingfisher Music, 20 Kings Rd
**Glasgow:** James Grant, 404 Byres Rd, G12
McCormacks 29-33 Bath Street G2
**Guildford:** Andertons, 91 Haydon Place
**Hadleigh (Essex):** Honky Tonk, 300 London Rd
**Harrow:** City Music, 14a Broadwalk
**Heald Green (Cheshire):** Sounds Great, 182 Wilmslow Rd
**Ipswich:** Axe Music, 41-3 St Nicholas St
**Leicester:** Carlsbro', 22-32 Humberstone Rd
**Liverpool:** Frank Hessy, 62 Stanley St
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**Romford:** Music Village (BAJ) 10 High Rd. Chadwell Heath
**Sheffield:** Carlsbro', 720 City Rd
**Slough:** ABC Music, 324 Farnham Rd
**Southampton:** Future Music, 85 St. Mary's St
**Sunderland:** White Sounds, 181 Hylton Rd
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# MSX vs THE REST

## How does MSX compare to five leading non-MSX rivals? We've been finding out

**Let nobody accuse us of being blinkered by MSX. Only the most fanatical MSX advocate would believe that MSX computers were what the world has been waiting for. There are many well established micros out there and MSX computers will have to stand up to some stiff competition. That's exactly what we've been doing—pitting a top MSX computer against five non-MSX machines. It is the ultimate test for an MSX micro, as it is vying with computers that any potential purchaser will also be considering.**

In the MSX corner we have the £300 Sony HitBit HB-75B. It is currently the best specified MSX computer, though one of the most expensive. Leading the others is the new, £130 Sinclair ZX Spectrum +, an upgrade of the best-selling ZX Spectrum. At around the same price is the junior Acorn computer, the Electron. A little more expensive, at £199, is another best seller, the Commodore 64. Next up is the Memotech MTX 512, a £275 computer that has found favour with enthusiasts. Finally we have the Amstrad CPC 464, the price of £349 including a colour monitor and a cassette recorder. The MSX computer is up against some tough competition indeed.

For the person after a home computer, such a range of machines presents a baffling choice. Price is one consideration. Specifications are another. They vary considerably between the six rivals, though all are adequate for most home micro uses, and have at least 32K of memory. There's the BASIC peculiar to each micro to consider too, as each uses a different dialect. Then there's the software and peripherals available, the documentation supplied with the computer, the performance, reliability and so much more. Choosing a computer is no easy task.

In the end it is impossible to say that one computer is, without qualification, better than all the rest. Each micro has certain strengths, each has some weaknesses. Our conclusions are at the end.

## SONY HITBIT HB-75B £300.00



**Standardization is the key to MSX. Each maker uses the same basic ingredients, with possibly a little extra something to spice up the mixture. In the case of Sony, the little extra is a built-in suite of programs — an address file, a memo file and a simple card file.**

Inside the Sony is the proven Z80A microprocessor. The Microsoft MSX BASIC occupies 32K of the 64K memory. A separate 16K video chip takes care of the graphics, leaving some 28K for user programs. Sound consists of three tone channels and one noise channel, ouyputthrough an external speaker.

The actual machine is biggish, due mainly to the internal transformer. In addition to the 18 alphanumeric, full travel keys, there is a large cursor keypad, five dual function keys, 17 other control keys and a red reset button. An on-off button completes the top plate.

Interfacing to the outside world is easy. There are two nine pin joystick ports for games players. Two 50 pin ports take cartridges, for instant program loading, or accessories such as disk drives. There is an RF output, for sending sound and video signals to a TV, a DIN audio/video socket, an RGB socket for a monitor plus a cassette port. The printer interface is a parallel Centronics device.

Two manuals are supplied with the Hitbit, along with cassette and RF cables. No software other than the built-in suite is supplied. That software has no documentation, but is very user friendly and needs only a data cassette to be fully functional.

Compatability is the main strength of the Sony. It will take any MSX peripheral or software. MSX BASIC is an advanced language too, with full interrupt commands so that joysticks, paddles, sprite collisions and so on can be incorporated into BASIC programs. There is a full screen editor too, to help correct programs more easily.

Thanks to the video chip, graphics are excellent. 32 sprites can be used, in any of 16 colours. There are four screen modes, with a maximum resolution of 256 × 192 pixels. Text is 40 characters per line, 24 lines per screen.

The Sony has more features than most MSX micros, is well engineeered and certainly proving popular.

## SINCLAIR SPECTRUM + £130.00



**Starting with the ZX80, Sinclair computers, more than any others, have made home computing as popular as it is today, these British designed micros have won tremendous acclaim and popularity. The Spectrum + is the latest model. It's a cosmetically updated version of the Spectrum.**

Like the MSX micros, the Spectrum + has a Z80A microprocessor at its heart. The BASIC is stored in 16K of ROM and there is 41K of free memory for user programs. There is neither a separate video chip, nor a separate sound chip.

Sinclair BASIC is idiosyncratic. Only one keypress is needed to enter a complete command work, and program lines are automatically checked for syntax errors before they are accepted. The keys also provide 16 simple graphics characters. 21 user defined characters and 22 colour codes. This means that each key has to serve up to six functions, and learning to use the Spectrum keyboard can take some time if you are used to a normal keyboard.

The keys themselves look rather smart but they have been known to come adrift from the computer and merely cover the membrane keypad of the original Spectrum. There are 40 alphanumeric keys, separated cursor control keys and 13 other control keys. This is on a body that is just 337 × 147mm. A separate transformer keeps the size down.

There are eight colours available for graphics, usable as border, paper or ink. Maximum resolution is 256 × 176 pixels, with the bonus of not needing to steal program memory to get high resolution. Text is 24 lines of 32 characters. Video output is to TV only.

The Spectrum + has its own speaker built in, but there is only one sound channel. There are sockets for connecting a cassette recorder and a single expansion port, but there is no joystick port. Two fold down legs tilt the keyboard forwards slightly.

The number of Spectrums sold has established a colossal base of software and peripherals for the Spectrum +. The +, with a better keyboard and with the price including a pack of six programs (chess, scrabble, a word processor, computer graphics and two games) and a demo cassette, make it an attractive first time buy. The number of Spectrums sold bears out that cost.

## ACORN ELECTRON £129.00

**Acorn made their fortune by winning a lucrative BBC contract and having their BBC computer adopted by schools. The Electron is a cutdown version of the BBC, at around half the price.**

The beige plastic case features a full travel keyboard. Inside is a 6502 processor, an alternative to the Z80A. The BASIC is stored in 32K of ROM and there's 32K of memory for programs, in theory. In practice, screen displays eat up a sizeable chunk of memory, and the free memory is at best, 21K, at worst, 9K. There are no separate ICs for sound or graphics.

Acorn BASIC has a healthy reputation. Some of the sound commands are redundant, as the Electron is not as well endowed in this area as the BBC, but the two dialects are identical. Like the Spectrum +, single key entry is available, though commands can be typed in normally if you wish. Acorn BASIC also has an extremely useful PROCedure facility, so you can build programs from small blocks. Add to that a full assembler, for the writing of Machine Code programs, many other commands to call machine functions and you have an excellent language.

The keyboard has 42 alphanumeric keys, a cluster of cursor keys and ten other control keys. Numeric keys doubled up as function keys. There's no on/off switch.

Graphic modes enable very high resolution indeed — up to 640 × 256 pixels at the highest resolution, though with only two colours. Up to eight colours are available in lower resolution modes, while in text modes, you can get 32 lines of 80 characters. Features like this explain the limited user memory.

There's only one sound channel, and a built-in speaker emits it. Other interfaces are limited to a DIN cassette socket, an RGB port, audio and video jacks and a 50 pin connector. To connect joysticks, printers, cartridges, modems and so forth, you'll need to buy an expansion unit.

Plenty of goodies come with the Electron. There's the separate power adaptor, an RF lead, a book called 'Starting Programming With The Electron' and an introductory cassette of simple games.

A fine BASIC is the main strength of the Electron. For computing students, it merits much consideration.

## COMMODORE 64 £199.00



**On a worldwide basis, Commodore can claim to be the best known producer of home computers. The 64 is the mainstay of their range and rivals the Spectrum in sales. A multitude of software and peripherals has been produced for it too.**

The main processor is the 6510, again eight bit and a development of the 6502. Total memory is 64K, with 38K available for programs. Graphics are handled by the Commodore exclusive VIC-11 chip, and there is another special chip, known as SID, to handle the sound.

The 64's keyboard consists of 37 alphanumeric keys, four programmable function keys and 15 other control keys. They are all full travel. The alphanumeric key have graphics functions too. Two keys control cursor movement, after a fashion.

A separate power adaptor keeps size down, though the chocolatey brown Commodore is chunky looking computer. It comes with an RF lead and a manual in the box.

Commodore's BASIC is pretty atrocious, compared to what else is available. To control the sound and graphics, complicated POKE commands must be used. They take plenty of getting used to. What BASIC commands there are can be entered in an abbreviated form, thus speeding up program entry.

Sound and visuals are excellent, thanks to the custom chips. Sound is output to an external speaker. It has three tone and one noise channel, giving an excellent range of sounds indeed. The graphics are good too, with 16 colours, up to eight sprites, all without stealing from program memory.

The Commodore has many ports. Two joysticks can be connected directly. TV or hifi can be connected too. To load cassette programs you'll need Commodore's own cassette recorder, as the recording method is different. For printers there is a serial port; there's a user port for other peripherals and a cartridge slot for cartridge software.

In its standard form, the Commodore is a fabulous games computer. The BASIC makes it less suitable for programming. But for running custom software, the Commodore 64 is an excellent proposition.

## MEMOTECH MTX512 £275.00




**Memotech are a British company who started life making accessories for early Sinclair computers. The MTX 512 is their first computer and it is aimed very much at the enthusiast. The emphasis is on specifications and expandability.**

The first noticeable feature is that the 512 is in an aluminium case of considerable size and weight, even with a separate power supply unit. It is a 64K machine that can be expanded up to 512K. Built in is a Machine Code Assembler/Disassembler and a special language called Noddy.

The central processor is our old friend, the Zilog Z80A. There's 24K ROM for the BASIC and 64K for BASIC programs, in all graphics modes. That's because there is a separate 16K video chip handling the graphics, as in the MSX computers. By plugging in new RAM chips, memory can be upped to 512K, a prodigious amount for a home computer.

The keyboard has 79 metal, full travel keys. There is no single key or abbreviated command method for entering programs. A bank of eight function keys is on the right of the keyboard, alongside a separate numeric keypad. This incorporates four cursor control keys.

The BASIC is good. Special commands allow up to eight 'windows' to be created, easy graphics routines to be constructed and the usual program structures. Noddy is a unique language that makes text handling programs much easier to write. The Assembler/Disassembler is for Machine Code programming while a Front Panel utility allows machine registers to be viewed or adjusted (for Machine Code programming).

Graphics and sound capabilities are similar to those of the MSX and Commodore. Maximum resolution is 256 × 192 pixels, with up to 32 sprites in 16 colours. Text is 24 lines of 40 characte:s. The sound has three tone and one noise channel, output externally.

There are interfaces galore on the MTX. There are ports for two joysticks, two RS232 devices, a parallel printer, cassette player, TV, a monitor, hifi and more. Besides the power supply and a very comprehensive manual, two games, a demo program, a blank tape and a head cleaner are supplied. On paper, the MTX512 is well worth its not inconsiderable cost.

## AMSTRAD CPC464 £349.00



**Amstrad have made their reputation in the mass market hifi field, offering superb value for money, well specified products. The first Amstrad computer is no exception to this rule.**

The price is as high as it is because you get not only a 64K computer, but also a built-in data recorder and a colour monitor. With monitors costing at least a couple of hundred pounds, you can appreciate the value of the Amstrad package. A dozen programs are thrown in for good measure.

The main processor is, yep, a Z80A. Basic takes up 32K of the 64K memory, but clever design leaves 42K for user programs. The cassette recorder is non-detachable, the monitor a medium resolution model.

The advantage of the built-in recorder is that cassette loading problems are very rare. The colour monitor gives a better image than a television, particularly useful for avoiding eyestrain. The only add-on you might need is a joystick, or two. There is a Centronics interface for a printer, a hifi output, RGB socket and an expansion port for disk drives and the like. Using another monitor is not possible unless you purchase a separate adaptor.

The computer proper is made of plastic. Brightly coloured keys adorn it. There are 47 alphanumeric keys, a separate numeric keypad, a cluster of cursor control keys and eleven other control keys, plus the cassette control keys. Diagrams show how everything is connected together.

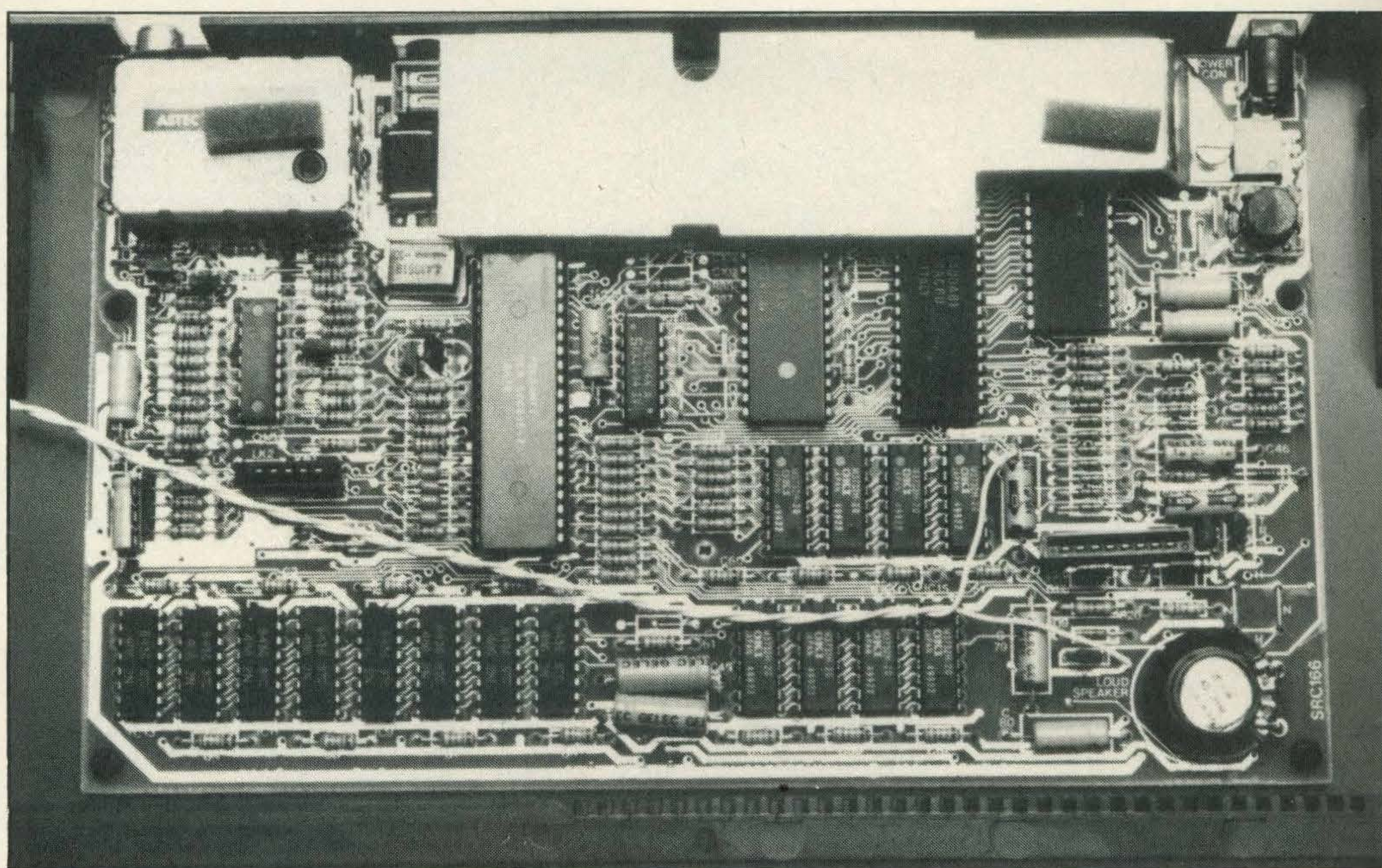
Amstrad's BASIC is pretty advanced. It has all you might expect, plus some useful commands for text or graphics windows, interrupt handling commands (to cause an action after a certain time), sound and graphics commands. Everything is well documented too.

Graphics are well up to scratch. The highest resolution (two colour only) is 640 × 200 pixels, or 80 characters per screen line. There are 27 colours to choose from, though 16 is the maximum that can be used at one time. Sprites aren't provided. Sound is three tone and one noise channel, with a built-in speaker.

Value for money is the main attribute of the Amstrad. At £239, with colour monitor, software and data recorder, it is proving a popular micro.

# SPECIFICATIONS

**Despite the apparently widely varying specifications, these six computers do have some things in common. They are all eight bit micros, using a Z80, 6502 or 6510 processor. All have a total memory of 64K or more, and 32K or more RAM. They are all capable of being expanded considerably, and with the appropriate software could handle most game, home or small business requirements. In short, buy any one and you'll have a real computer on your hands.**



**Inside the Spectrum + is the workings of the best-selling Sinclair Spectrum, based on the Z80A microprocessor**

Memory is the most important on board specification. It is divided into unerasable ROM (Read Only Memory), holding the BASIC and operating system, and RAM (Random Access Memory) for programs. In addition, the Memotech and MSX micros have separate 16K video chips.

The Spectrum + ROM is the smallest, at just 16K. It has a non-Microsoft BASIC, so comparing the standard of the BASIC on the basis of ROM size is a little misleading. The Commodore has a 20K ROM, and a much more limited BASIC. Memotech has a 24K BASIC while Amstrad, Acorn and MSX have 32K of BASIC in their ROM.

When a program is running, memory is need for keeping track of variable, handling the graphics and so on. This can take quite a lot of the RAM that is, in theory, available. The Electron, though with a specified 32K RAM, gives at best just 21K for programs, and in the highest resolution mode, a meagre 9K. In MSX computers the 32K of BASIC overlays the RAM, with the result that just 28K is available for BASIC programs. For Machine Code, the available memory is 60K.

Commodore has a similar overlap system, though the smaller BASIC means the 38K is available for BASIC. The other computers have discrete ROMs, enabling larger BASIC program areas. The Spectrum has 41K available, the Amstrad 42K and the Memotech an impressive 64K. With non-BASIC programs, their program areas are not increased.

Don't be blinded by large numbers though. You can get very complex games or databases of considerable size in 20K. The amount of memory you'll need will depend on what you want to do with your micro — all the micros here have adequate memory for most requirements.

If you want good graphics for commercially produced games, don't worry too much about graphics specifications. Software writers of any stature will use machine code, avoiding any limitations in the BASIC. If you write your own graphics routines in BASIC, the more colours the better.

Sprites are a useful feature too. The Amstrad has the most colours, 27, the Electron the least — just eight. The others have 16 colours.

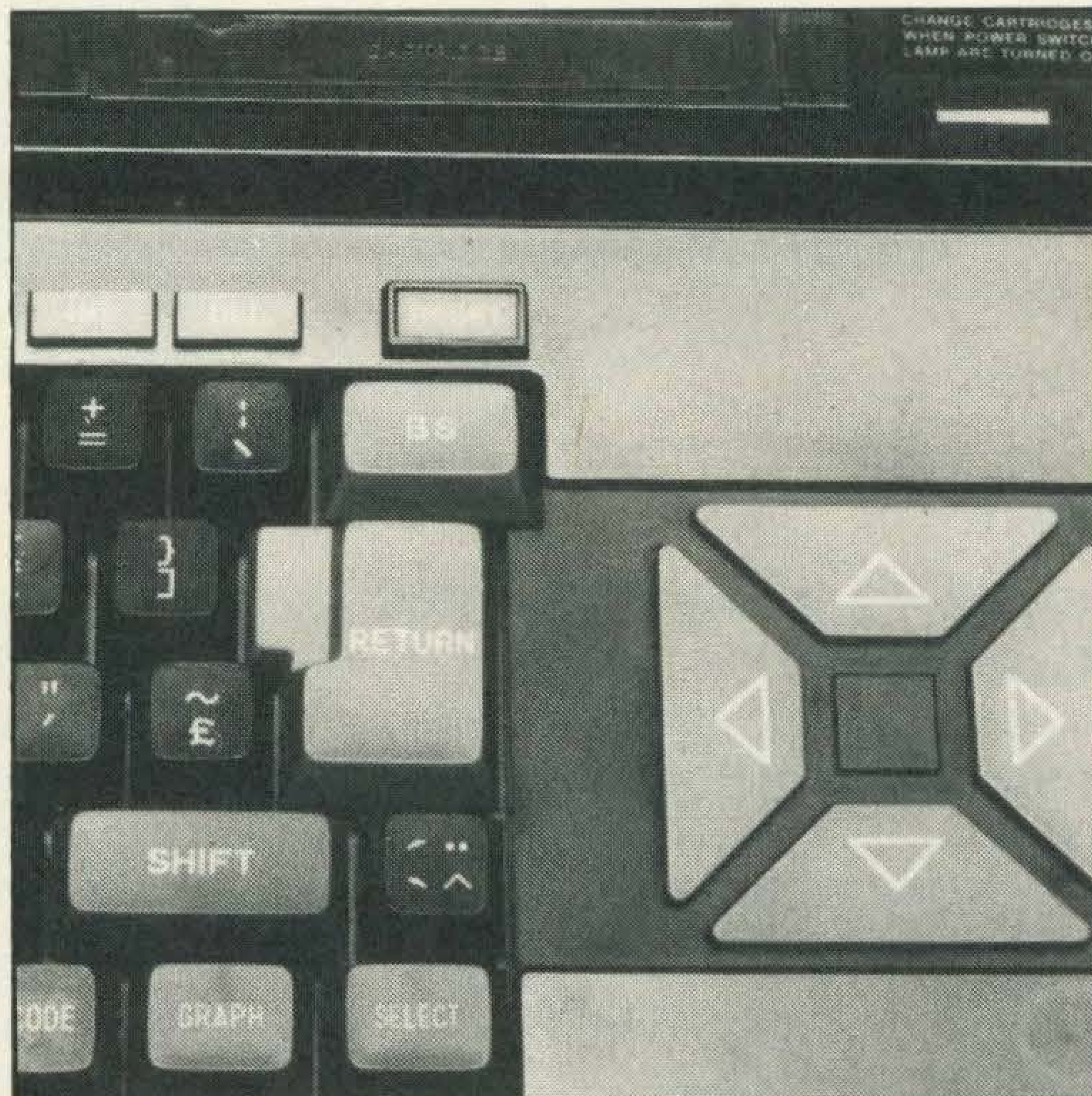
Sound is more dependent on specifications. More channels will give better sounding games and music. The Spectrum + and Electron do worst in the sound arena, with just one voice. A means of outputting the sound to an external speaker is an advantage too, as the inbuilt speakers of the Acorn, Amstrad and the Sinclair micros are pretty poor.

When comparing specifications, look too for what peripherals can be connected. The Electron and Sinclair won't take joysticks, for instance, without an adaptor that must be bought separately. In this area the Memotech and MSX computers score particularly well.

Extras that come with the computers must be included in a comparison of specifications. The Sinclair and Memotech have a selection of software supplied. The Amstrad has the colour monitor and cassette player. The Sony has the memo/database firmware.

Comparing specifications puts the Amstrad and Memotech computers in joint first place. The Electron and Spectrum + don't do so well, while the Commodore and Sony are par for the course.




**Amstrad CPC464 has a data recorder built in. Sony has a good cursor keypad, a reset button and an accent key**

# GRAPHICS/SOUND

**Comparing the graphics abilities of the six rivals shows all the machines to be well specified, and each better in some areas than others. Much depends on whether you want to design your own graphics, or whether you want to leave that to professional programmers.**

Maximum screen resolution is one limitation. The Electron can show the most detail — 640 × 256 pixels, though that is with only two colours. The Amstrad does nearly as well, at 640 × 200 pixels, though again with just two colours. Such abilities enable 80 column text display, of use only if you are formatting for an 80 column printer. The Spectrum + shows the least detail of the six rivals.

On some of the computers, you have a choice of screen modes. This determines the detail that can be shown, how many colours can be used, what graphics can be used and so on. On the Electron there are seven modes. MSX and Memotech offer four modes, Amstrad has three.

When it comes to the choice of colours, Amstrad comes out ahead. It has a range of 27 possible hues, though only 16 can be used at any one time. The other machines, bar the Electron, all manage 16 colours. Electron owners will have to make do with eight colours.

Sprites (characters that can move freely around a screen) are a great aid to good graphics. Only the Sony, Memotech and Commodore machines have them. The Commodore allows up to eight independent sprites, MSX and MTX micros allow up to 32 sprites. Sprites are much easier to define on these machines too. The Sony even has built-in sprite collision detection, to make BASIC sprite programming easier.

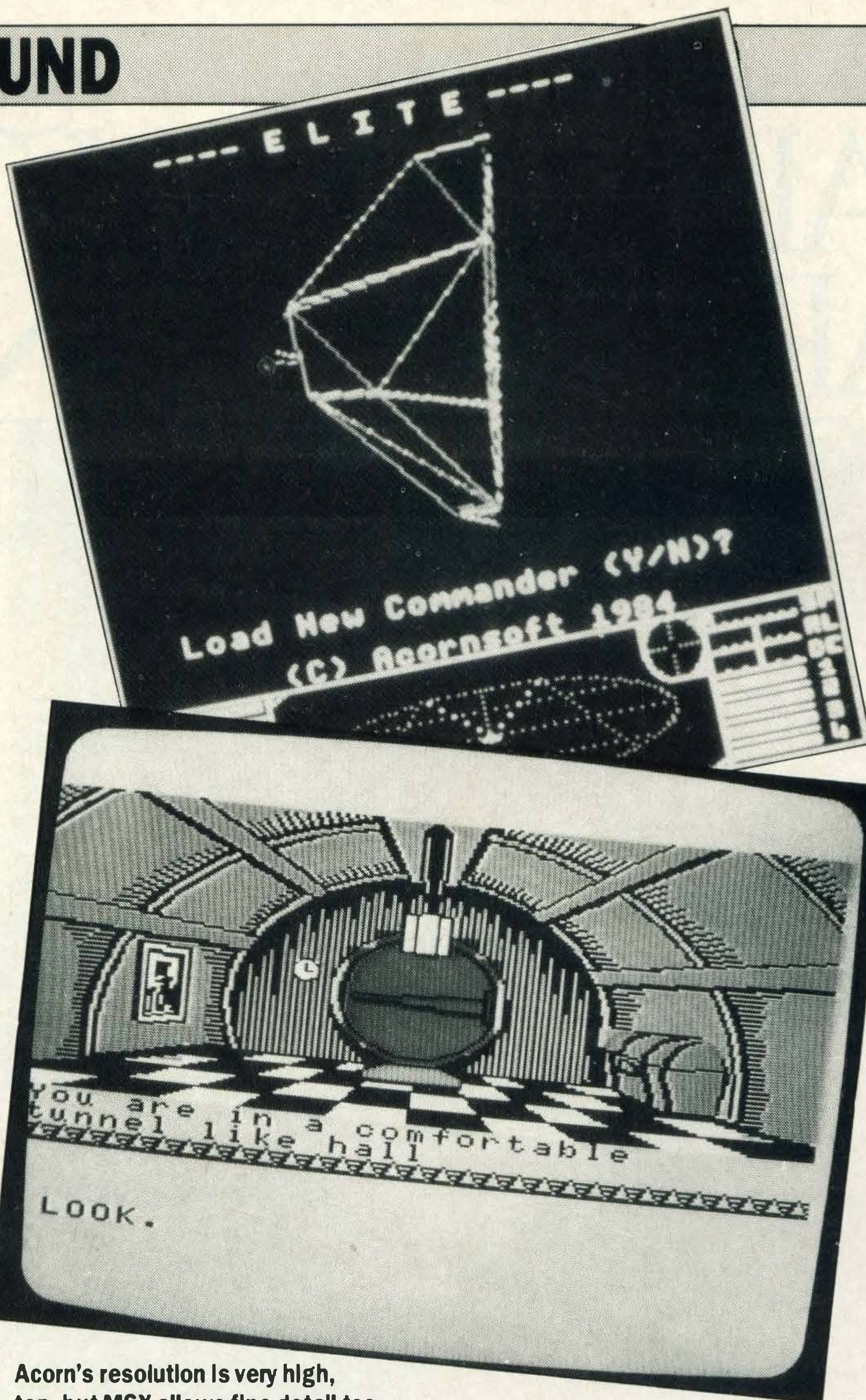
BASIC graphic commands are best on the Sony. It has a whole language for drawing graphics. Commodore owners will have the most hassle with graphics, due to the limitations of the BASIC.

Sound comparisons see the Electron and Spectrum + bottom of the pile. They have only one voice and the sound is emitted from a tiny built-in speaker. The other micros have three tone channels and one noise channel, offering much the same variety of sound. There's a built-in speaker on the Amstrad. With the Sony, Commodore and Memotech micros, sound is through either a monitor or a separate amplifier.

Programming different sounds is easiest on the Sony, thanks to the sub-language that is based on normal musical notation. The other machines have you inputting pitch and frequency numbers, a trial and error process at the best of times. On the Commodore, you'll have to use the BASIC sound commands which are very limited indeed, and a good knowledge of how the sound chip works is needed if you want to make pleasant noises.

BASIC limitations fall by the wayside when you see and hear what is done in commercially produced software. Our screen shots show how the graphics compare. It is immediately obvious that sprites make for smoother, more realistic images. High resolution can be an advantage, though the restriction on colours is a limitation.

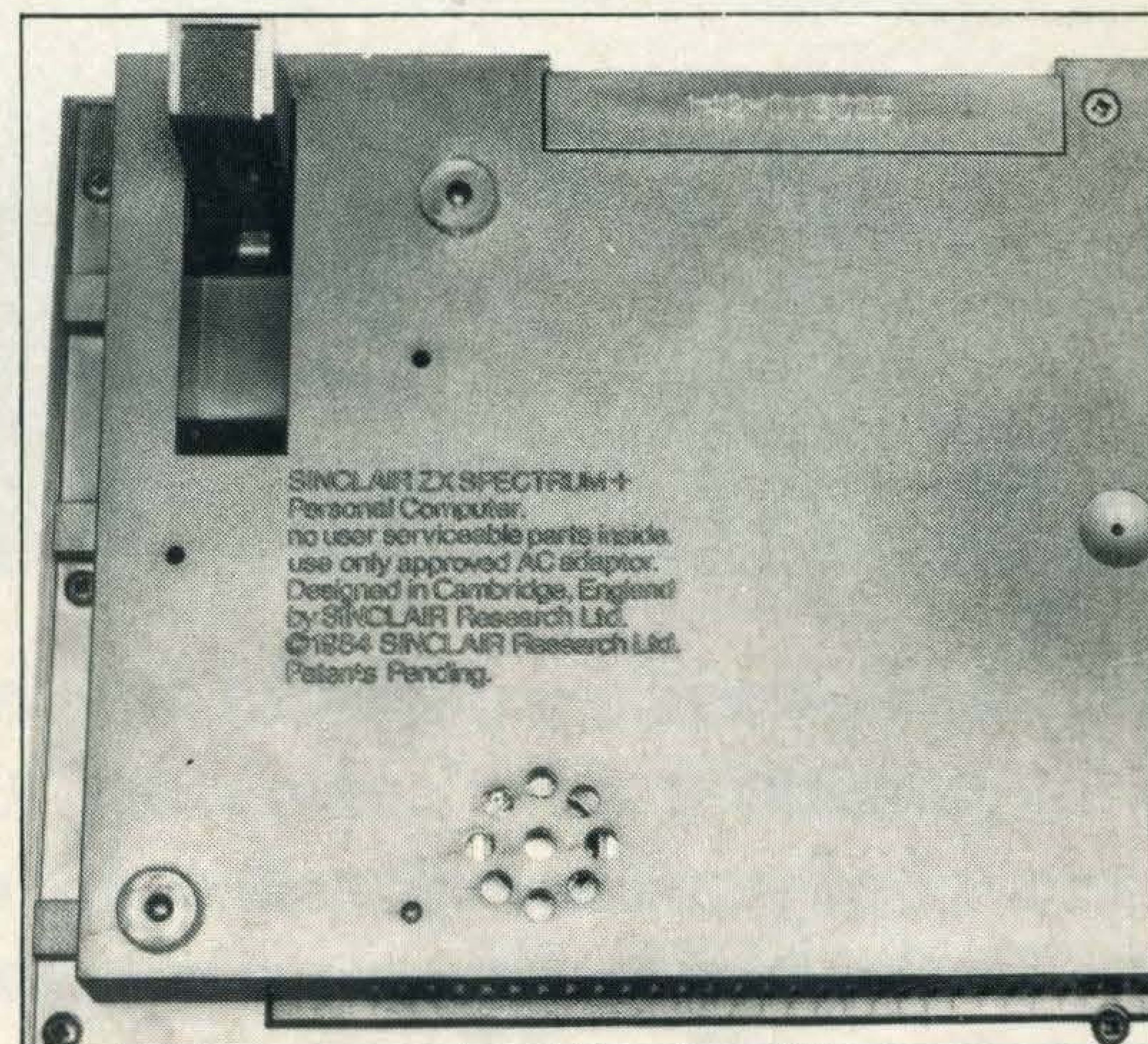
In the sound and graphics area, MSX is a clear winner, particularly if you want to do your own programming. The Memotech comes close in specifications and the Commodore would be an equal if it had a better BASIC. The high resolutions of the Acorn and Amstrad offerings are useful for certain things, such as word processing, but it is worth remembering that an adaptor to give 80 column display on MSX micros is available.




**Acorn's resolution is very high, top, but MSX allows fine detail too**




**Commodore's keys are marked with graphic symbols**




**Spectrum has a built-in speaker**

# NOT ALL MSX SYSTEMS ARE BUILT ON YEARS OF EXPERIENCE.



While there are plenty of MSX home computers about, only Sanyo's MPC 100 can claim a heritage of years of experience and expertise.

The kind of experience other systems can't simply be programmed with.

The kind of expertise that has made Sanyo one of the world's leading manufacturers of business micros.

With a reputation for quality and, unlike t MSX competitors, a factory entirely devoted t computer production.

The MPC 100 also boasts features impre

# ONE IS.




ough to match its pedigree. 64K memory, perb 16 colour graphics, and 3 channel/8 octave und. Operable by joystick or light pen options, ch machine includes a bonus of two free pieces software.

Most MSX manufacturers have yet to prove themselves in computers. Sanyo have been doing so for years. Which is worth remembering, or instead of solid rock, you could end up building your MSX business on sand.

SANYO

SEE SANYO, THEN DECIDE

FOR FURTHER DETAILS CONTACT SANYO MARUBENI (UK) LTD., SANYO HOUSE, OTTERSPOOL WAY, WATFORD, HERTS. TEL: WATFORD 46363. ASSOCIATE MEMBER OF RADIO, ELECTRICAL AND TELEVISION RETAILERS' ASSOCIATION (RETRA) LTD.

# BASIC

**The BASIC language in all these micros bar the Spectrum + is a dialect of Microsoft BASIC, written to the manufacturer's brief. BASICs vary because machines have different strengths, different makers have different ideas about what makes a good BASIC and experience shows what features are likely to be most appealing. Sinclair have developed their own BASIC, independently of Microsoft.**

When the dialects are compared, just 27 words are common to all six languages. They are some scientific functions (SIN, EXP and ABS for instance), the most basic of BASIC words (RUN, GOSUB, PRINT, LIST and so on) plus a few miscellaneous terms (CHR$. LEN RESTORE). If you wanted to write a program that ran on all six computers, it would need to be pretty simple. If you want a structured program with graphics and sounds, you will need to familiarize yourself with each machine's BASIC.

Judged solely by the number of BASIC commands available, the Commodore is the pauper of the troop, with just 63 instructions. Memotech and Sinclair BASICs have just under a hundred commands. Acorn feature 126. MSX BASIC accepts 155 words, while top of the pile is Amstrad, with 159 separate commands.

Of course there's more to all this than just the number of commands. The ideal BASIC would have easy to use graphic and sound commands, the ability to incorporate peripherals into BASIC programs, simple access to the computer's operating system and fast program execution times.

The most common method of measuring the speed of different BASICs is through a system of benchmarks. These are eight short programs that make the computer execute a simple function many times. The time to run each program is noted, and times can be compared.

Slowcoach is the Sinclair, with an average time of 54.8sec. The Amstrad has the fastest BASIC, averaging just 14.6sec for the benchmarks. The Sony is on the slow side, at 44.4sec. Memotech and Acorn have faster BASICs, the Commodore is middling.

What this means to you, the user is that games or routines written in BASIC will be speedier on the Amstrad than on the Sinclair, given the most economical program structures are used. Stick to Machine Code though and you'll not find a slow BASIC a handicap. Machine Code operations are much, much faster than BASIC equivalents.

Efficient programs are built on efficient programming. Certain BASIC command structures make this far easier. FOR . . . NEXT and IF . . . THEN commands are in all six BASICs. So are GOSUB and GOTO commands. An ELSE extensions to the IF . . . THEN structure is available on all bar Sinclair and Memotech micros. Acorn provide a REPEAT . . . UNTIL loop and a very useful PROCedure function. This allows you to write a program in blocks, calling the blocks, or procedures, as they are needed. Amstrad provide a WHILE . . . WEND loop, a close relation to the REPEAT . . . UNTIL.

Entry of programs is facilitated by a shortening of commands. With Spectrum BASIC, a single key press is used to enter each command — once you get used to the system it is straightforward. On the Electron you can use either a single keypress to enter a command, or type it in letter by letter.

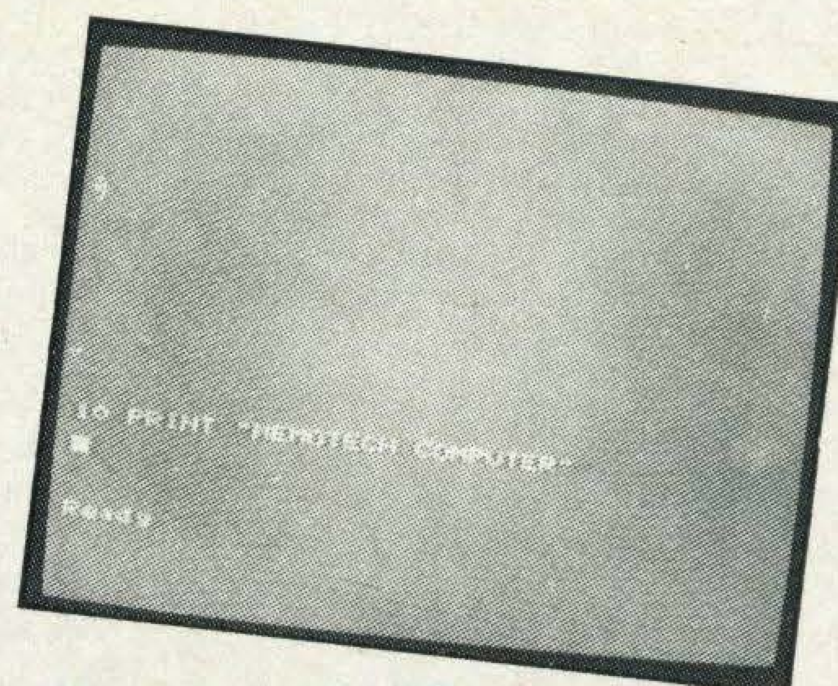



Spectrum has single key entry of BASIC keywords. It takes getting used to

MSX computers have five dual-function keys with ten frequently used commands on tap. Their function can be easily changed so they could input a frequently used command or command sequence.

A good editor makes entering and debugging BASIC programs so much easier. MSX computers have far and away the best editor. You can amend any line, anywhere on the screen, inserting or deleting at the stroke of a key. Pressing RETURN enters the line or lines. The Sinclair system of checking each line before it is accepted is excellent too.

Memotech allow one line to be edited at a time, with insertion and deletion. Incorrect lines can't be entered either, as on the Spectrum +.



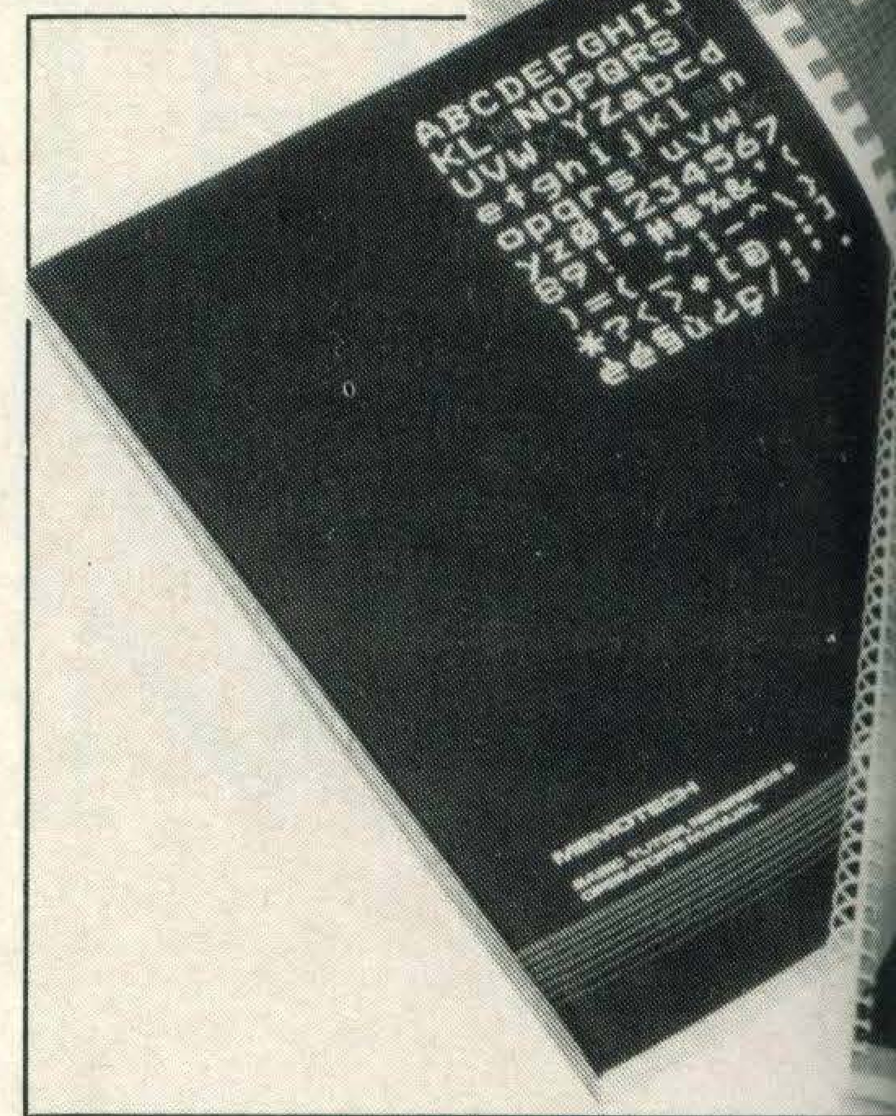
Memotech's BASIC screen area

When writing BASIC programs, error messages can be vital. Most are pretty specific. The Acorn and Amstrad computers print up not only the error message but also the erroneous line for you to correct.

Of course teaching you to use BASIC and the computer is the role of the documentation supplied with the machine. Standards vary widely.

The Sony comes with two ringbound books. The first is a very simple, almost patronising introduction to the computer and BASIC. By the end you will have written some short programs and know the fundamentals of the language. The second book examines each command in detail, plus the interface devices. It is a good combination.

Sinclair supply a colourful booklet that looks good and gives a thorough overview of Sinclair BASIC. Commodore's manual is the least impressive, being dry and not easy going for the beginner.




Manuals for the six micros

Memotech's manual is stuffed full of technical information about the MTX computer and its components. The BASIC is dealt with rather sketchily, but the Noddy and Assembler packages are covered too. Amstrad have a good manual too, and it is more accessible to the newcomer. Acorn, with both a book and a manual, provide solid technical information and a good introduction to BASIC. Of course there are many books written for and about these six computers, so any deficiencies in the accompanying documentation can be overcome, at a price.

There are several BASIC features that will be welcomed by all programmers. The first of these is a facility to automatically generate line numbers. It is found on MSX, Memotech, Acorn and Amstrad micros, absent on Sinclair and Commodore machines. A renumber facility, to renumber programs when they have been written and debugged, is a feature of the Sony MSX and Amstrad computers. To ease debugging, a trace facility is another useful aid. It records the path of a program, so errors can be more easily located. You'll find this feature on MSX, Amstrad and Acorn micros.

When you've finished a program, it is handy to know that the recording of it is uncorrupted. For that you'll need a verify facility. Neither the Amstrad or Acorn micros have one. A

merge facility is another thing to look out for. With this, you can join two programs together in memory. MSX, Spectrum and Amstrad computers have this.

Being eight bit computers, the range of integer numbers that can be handled by these micros is from −32767 to 32768. Outside that range exponential numbers are used from 2.9 × $10^{-39}$ to 1.7 × $10^{38}$. MSX micros can handle such numbers up to 14 accurate places; the competitors manage only nine accurate places. MSX BASIC can be ordered to restrict accuracy to six significant figures, saving on memory.

Decimal is the most used number base. Computers work in binary though, and if you had the Amstrad or Sony, you could work with binary numbers. These two also you to work with hexadecimal (base 16) numbers, and the Sony alone caters for octal (base eight) numbers.

All six micros store number and string variables. The Spectrum + and MTX micros lack integer variables, a more efficient means of storing smallish numbers. The Spectrum + also has no time variable. With the other computers, events can be programmed to occur at set times or intervals.

Comparing the BASIC languages shows that, speed aside, MSX BASIC is very well constructed. Commodore's BASIC is the most restricting and Sinclair's has notable omissions. Memotech BASIC is let down on the mathematical side. Acorn and Amstrad BASICs are both very good.

## KEYBOARD

**Good BASIC and specifications are all very well, but an unfriendly computer with a poor keyboard can be a liability. Facilities such as cursor control keys, reset buttons and so on can make a big, big difference.**

The Sony is well equipped in this respect. It has an on/off button to save pulling plugs in and out of sockets. There is a red reset button, giving a warm start. To the right of the main keyboard is a cluster of large cursor control keys that are far better than any other cursor control keys in this group of micros.

The all important return key is extra large and in the distinctive grey of other control keys. There are two shift keys, a caps lock facility and other keys so you can insert or delete characters easily. With the five programmable function keys and facilities such as automatic line generation, the Sony is particularly easy to write programs on.

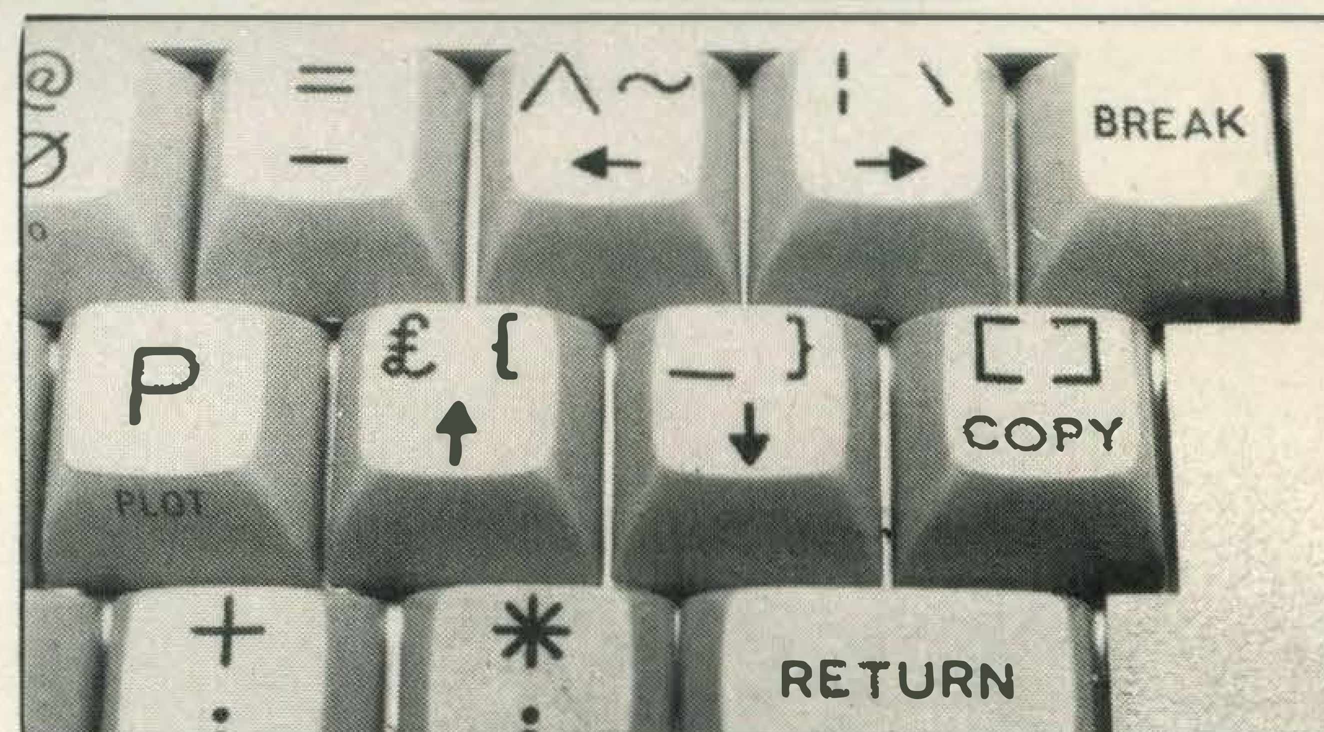
Keys are slightly concave and have a firm, positive feel when pushed. Text entry with the Sony is a joy and it is a product with a real feel to it.

At the opposite end of the spectrum is the Spectrum +. This has the idiosyncratic single key entry system, designed to make life very awkward for those not used to the system. Keys are marked with a jumble of words, letters and shapes and no colours signal significant keys.

The individual keys are scalloped and a supported in such a way that larger keys have a very definite wobble. Keys can come adrift too. Pressing them gives a mushy sensation and the whole arrangement is rather sorry.




Memotech has numeric keypad and a bank of function keys




Acorn's cursor keys are found on the top right of the keyboard

Cursor control keys do exist next to a miniscule space bar. There is no on/off button, nor a power on light. A reset button is found under the side of the keyboard. Two legs raise the whole computer slightly to improve the angle of the keys, but anyone wanting a computer for entry of programs or text won't find the Spectrum + very pleasant.

Memotech's metal finish gives the MTX 512 a solid feel and it is blessed with all manner of keys. On the far right are the eight function keys, though they are of little use unless you incorporate them into a program. The numeric keypad is fine for entry of large amounts of numeric data. It has cursor arrows marked on four keys, though this arrangement is not as good as a proper cursor keypad.

No colours liven the keyboard and the return key is not easy to locate. The numeric keys have control functions marked on them, helping program entry a little. There is no on/off switch on the body of the computer — a hassle if the power supply is out of reach.

Text entry is quite pleasant. They keys have a firm feel to them. Program entry is not so good, as lines are entered at the bottom of the screen, and transferred to the upper part of the screen when the return key is pressed. It can make reading programs tricky.

The overall impression of the Amstrad keyboard is a plasticy one. There are plenty of bright colours, a cluster of cursor control keys, a numeric keypad and the cassette recorder section. The unit is long and unwieldy because of this.

Best features are an enormous return key, a power on light, well spaced keys and an on/off switch. The kit also has far fewer trailing wires than the other computers, giving a tidier desktop. Against this, the keys have a cheap feel about them and rather too much bounce.

Commodore's keyboard is nicely angled and has function keys on the right. There's a power lamp, a large return key and the keys feel good. The four cursor keys are a joke. Still, for word processing, the Commodore is well made.

The Electron's keyboard also has a ridiculous cluster of cursor control keys. It lacks a numeric keypad and other luxuries, has no power switch and the keys rattle a little too much.

On the keyboard front then, Sony are out ahead, Amstrad, Memotech and Commodore are on a par and the Spectrum falls well behind.




Sony's keyboard has function keys and a solid feel that's fine for typing

# SOFTWARE

**No prizes for guessing which computers come out tops when it comes to the matter of software. Both the Spectrum and Commodore 64 have become firmly established as the favourites with software writers. The large number of Spectrum and Commodore owners is responsible for that situation.**

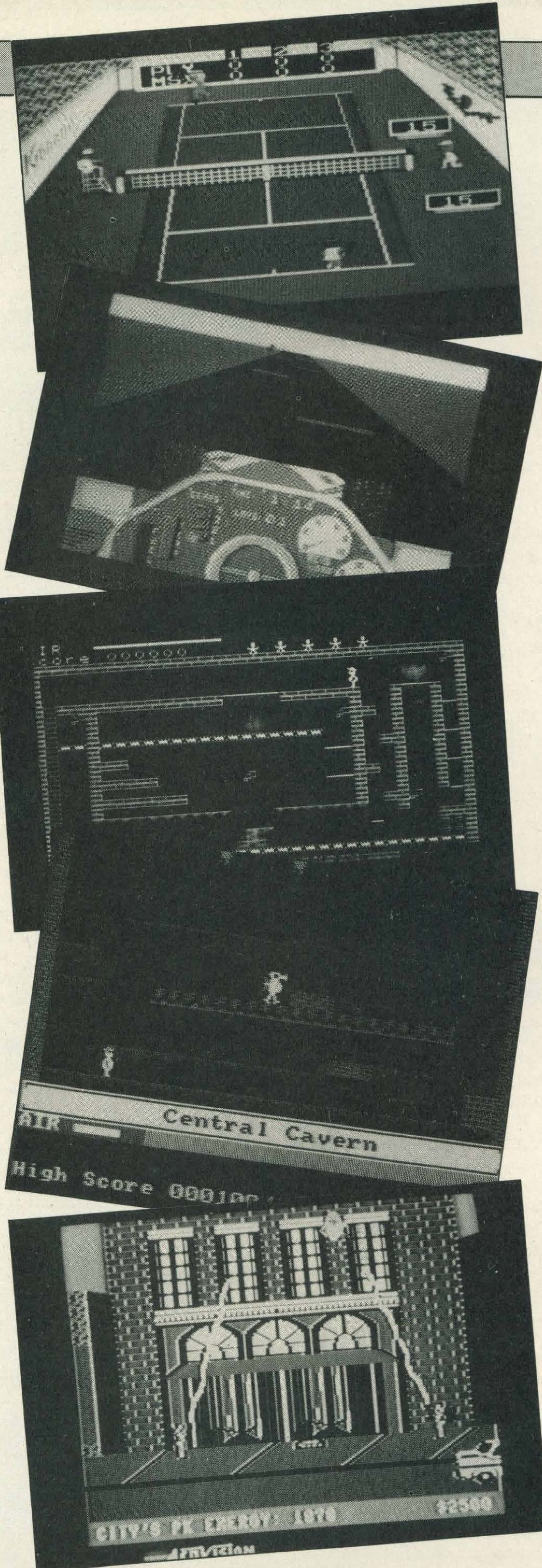
The Spectrum + is by and large a games machine, and has an enormous variety of games available for it. Whatever your taste, there will be something. There is also plenty of more serious software, but the limitations of the keyboard means that the Spectrum + is not best suited to things such as word processing.

The Commodore 64 has attracted a host of entertaining and serious software, and is used for all sorts of applications. One problem is that only a Commodore-compatible cassette recorder can be used for loading programs, and this means some extra expense. Loading times are on the long side too. Still, disk based software is available if you have a disk drive.

## 'The Acorn Electron does, in theory, run most of the software written for the BBC computer'

For the other machines, Sony included, not nearly so much software is available. Software companies are unwilling to develop software for a machine that may not be available in large numbers. Without software, the computer has less chance of succeeding, and so less software is produced and so . . . Memotech have fallen foul of this. Most of their software is produced in-house and what there is is either old hat or not up to Spectrum and Commodore standards. This situation seems unlikely to improve.

The Acorn Electron does, in theory, run most of the software written for the BBC computer. However, the Electron runs at a slower pace, so arcade games are not as fast.




**Matchpoint on MSX, Chequered Flag on Spectrum, Pothole Pete on Memotech, Manic Miner on Amstrad and Ghostbusters on Commodore**

The limited memory left when graphics are used is another problem too. Electron software is certainly around, but it is not in the same league as that of the big two.

Amstrad's CPC 464 has got off the ground nicely and is attracting many software houses. In time it should have a large library of titles available, both for games and for more serious applications. The standard is high too and the built-in cassette recorder means that cassette loading problems are rare.

## 'The big software houses are aware of the importance of MSX and are busy converting titles'

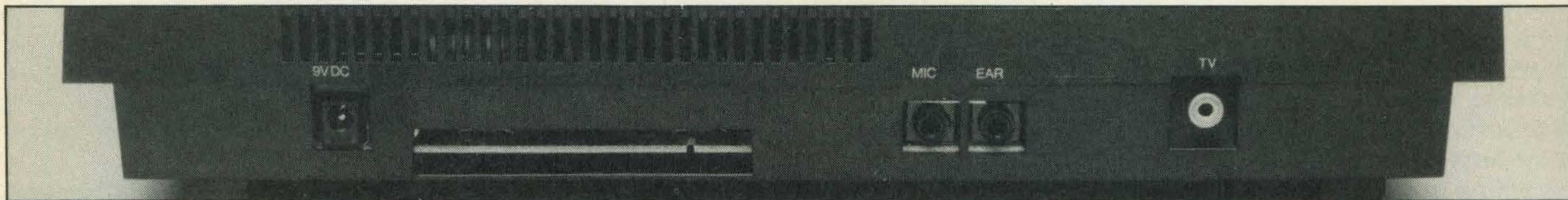
MSX is the newest arrival on the computer scene, so it is only natural that software is still in relatively short supply. Even so, most of the big software houses are aware of the importance of MSX and busy converting best selling titles to run on the new machines. At the moment, the main emphasis is on game and educational software, as that is where most sales are made.

MSX has two more factors in its favour too. The first is the ability to take cartridge-based software, loading instantly and every time. Cartridge software is independent of machine memory too, so can be very complex.

The second factor is that MSX opens the way for the Japanese software giants to get involved in the British scene. Companies such as Konami and Hudsonsoft are producers of many excellent titles and will certainly be setting high standards.

Comparing software at the moment thus puts the Commodore and Spectrum computers at a distinct advantage. The Memotech is outclassed, while Amstrad and Electron software seems to be on the way to becoming established. MSX software is developing very rapidly too, and providing you don't want thousands of titles in every shop right now, won't disappoint.

# EXPANSION




Sinclair Spectrum + also needs an expansion device for attaching peripherals such as a printer or a modem or a disk drive

**The computer is only the heart of what can be a large system capable of doing all sorts of tasks. That is why the expansion potential should be considered.**

Black marks go against the Electron and Spectrum + right at the start. In their as bought form, very little can be added to them. For that you'll need an expansion interface, and these cost around £50 each. Until you get these devices, you'll be unable to connect joysticks, printers, disk drives and so forth.

Amstrad aside, all these micros can be connected directly to a television set and cassette recorder. To use anything other than the supplied monitor, the Amstrad needs an adaptor, costing around £30. The monitor is probably all you'll want to use though.

**'In short, all six computers can be made to accept the most popular types of peripherals'**

Sony give plenty of interfaces. For better image quality there is an RGB socket and DIN audio/video socket. There are two joystick ports and an interface for a parallel Centronics printer. There are also two general purpose expansion ports, for disk drives, cartridges, communications adaptors and much, much more. MSX has been designed, from the outset, with expansion in mind. In the future, we are told that it will be able to run TVs, HiFi, central heating, musical instruments and such things from an MSX computer. At present, this is not possible, but the track record of the companies involved should ensure such things do appear.

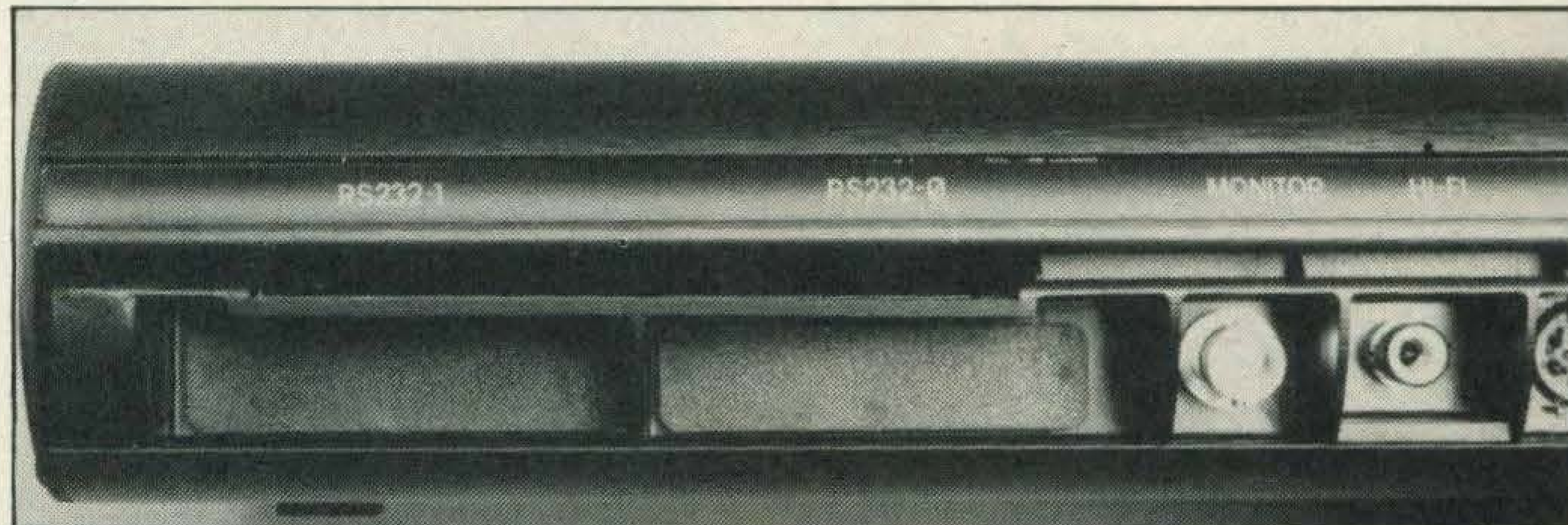
The Memotech is another computer with expansion as a strong point. It can be expanded internally to give up to 512K of memory. There are two joystick ports, a printer port and outputs for both monitor and amplifier. The two RS-232C ports aren't wired in, and that's a problem. Still, enthusiasts will be able to connect a whole host of goodies.

Amstrad have launched only a few peripherals to date. The CPC 464 will take two joysticks and a disk drive, a parallel printer, as well as sending sound to an amplifier. A general purpose expansion port should give scope for more peripherals too.

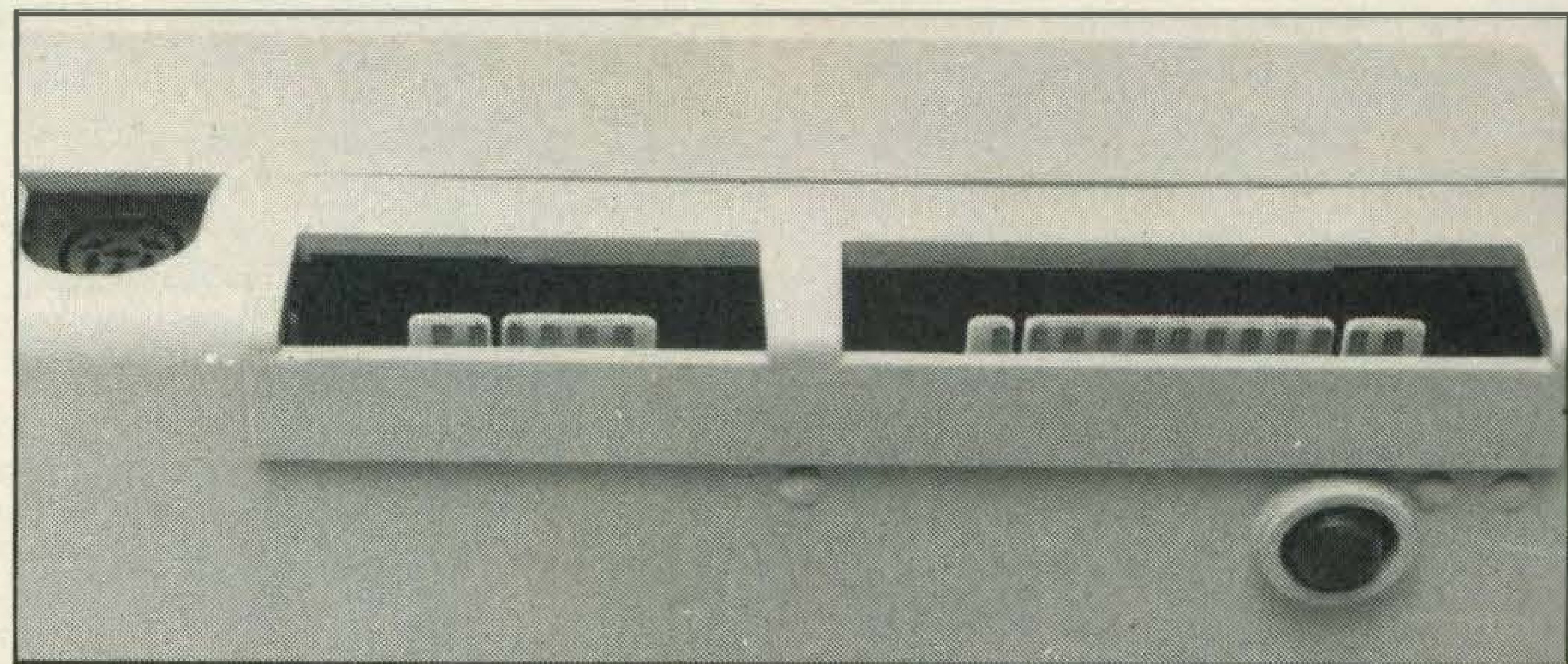
Commodore have their own interfaces, restricting the printers, cassette recorders and suchlike that can be used. This restricts expansion slightly, but most peripherals are available. These include modems, disk drives and cartridges. Two joystick ports are a standard feature.

The Spectrum + has a huge range of supporting peripherals available, thanks largely to the ingenuity of product designers. The Interface 1 allows joysticks, serial printers, modems and the infamous Microdrive units to be attached. Spectrums can also be linked together in a network.

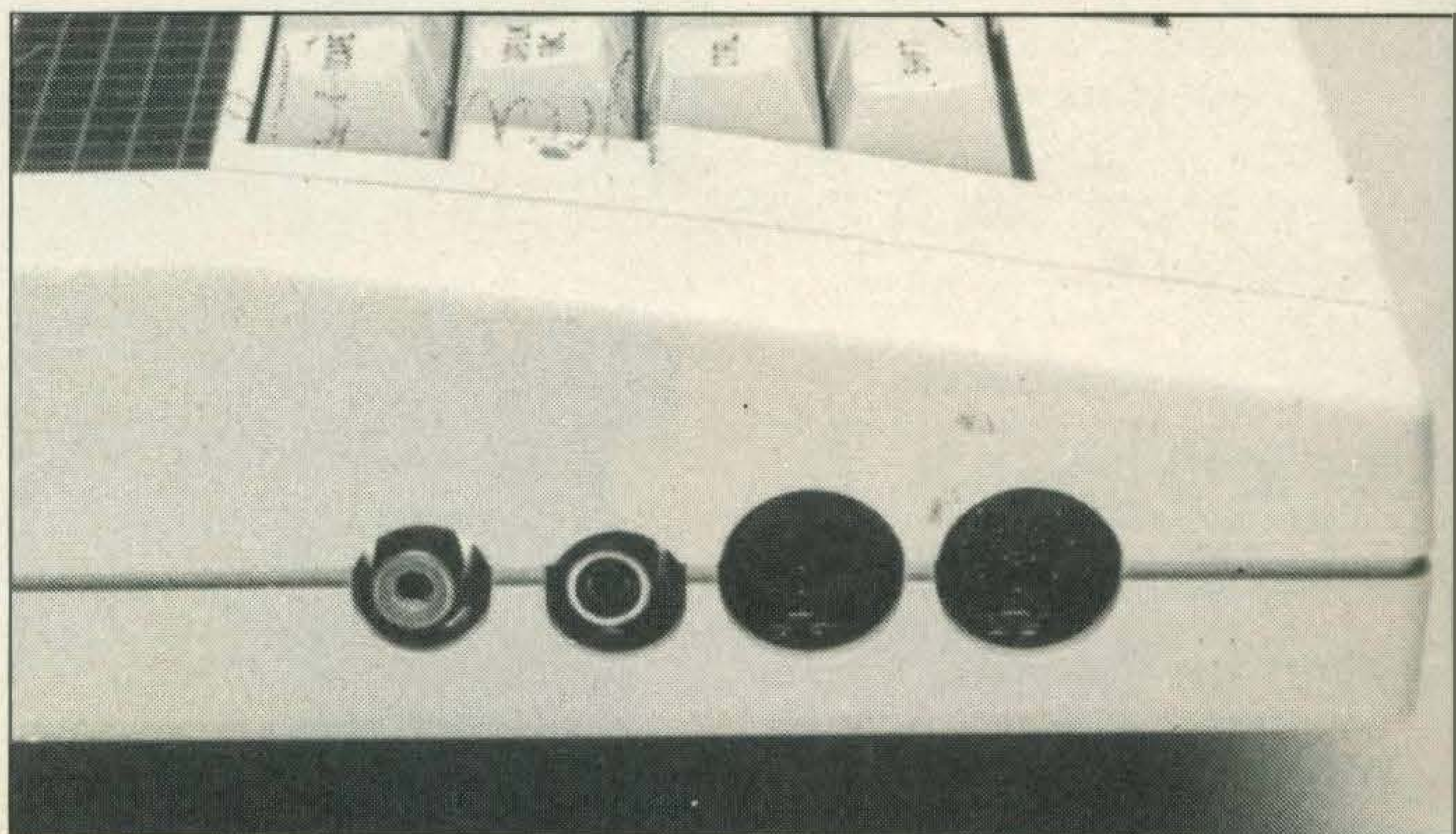
Acorn's expansion units for the Electron allow all the usual peripherals to be connected up, including a disk drive, cartridge software, printers and joysticks.




Memotech's two RS-2332C ports can be wired in to give useful facilities



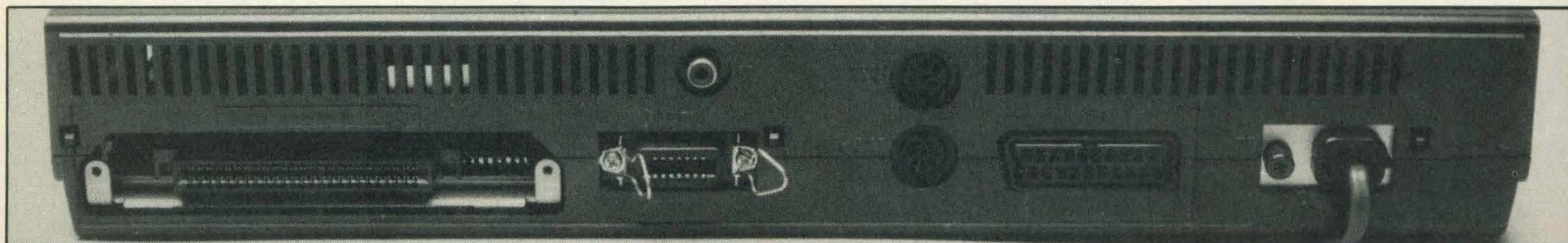
Commodore's expansion bus is of their own design but well supported



Acorn's expansion is limited without an accessory expansion peripheral

In short, all six computers can be made to accept the most popular types of peripherals. You may need an adaptor, or be restricted to certain types of devices, but a system can be built around each computer.

MSX is, if promises are fulfilled, the most expandable machine of the bunch, and the one to back if you are into gadgets. The Memotech is the most expandable in its original form. Spectrum and Electron computers will need extra spent on them if they are to be expanded, while the Amstrad is a little short on peripherals at the moment. The Commodore is fine, if you stick to the right peripherals. But MSX comes out well in this field.



Sony has a standard expansion port, an RGB socket, a parallel printer port and two joystick ports. Only RS-232 is missing

# Verdict

**Now that we've considered how the various computers stand in relation to each other, how does MSX shape up? Is it a contender, or is it outdated and outspecified?**

What is immmediately evident is that MSX doesn't stand for innovative technology to turn the world on its head — yet. It is also fair to point out that MSX is still in its childhood, and future developments may well be both amazing and technically far ahead of anything else. Remember too that the MSX representative in this group is the most expensive MSX micro (bar the Yamaha CX-5M synthesiser) and MSX micros with the same basic specifications are available for £200 or less.

The outstanding areas of the Sony and other MSX computers are in their usability, graphics and sound potential. Thanks to a BASIC tailored very much to home programmers wanting to use the features of MSX computers to the full, MSX machines are the most user-friendly available.

Both the Amstrad and Acorn computers have BASICs of a comparable standard, and MSX BASIC suffers from being rather slow. That is not a major shortcoming as Machine Code programming will give all the speed you want.

Purely on specifications, the only MSX failing is that the BASIC overlaps RAM, leaving less user memory for BASIC programs. Again, Machine Code users will not suffer from this, and in all other respects, the Sony is as well specified, if not better specified, than the rivals.

Expansion, on present form, leaves MSX a little behind. However, if things go according to plan, you'll be able to expand MSX in a way the other computer manufacturers can only dream of.

Similarly, in the software field MSX is at present still too new to be in a strong position. The signs are good though, and we confidently expect MSX software to be every bit as varied and exciting as that for Commodore or Spectrum machines.

Value for money considerations see the Amstrad as king, if you want a monitor and tape player. If you already have a colour TV and a portable cassette player, all you are really getting is less wires. The Commodore, Electron and Spectrum + are good value too. The Sony MSX is a bit pricey, but it is a quality product. Cheaper MSX machines are available.

The picture that emerges is one that should cheer MSX supporters. True, an MSX computer on its own is merely a very competent machine using existing technology. Against this, the MSX concept is so broad in its sweep that in time it will have a profound influence on the gadgets we use today. An MSX computer will become an integral part of the household — that's the promise of MSX. It is a promise that the other systems won't be able to achieve easily, as the companies are not producers of other consumer goods. That's the strength of MSX.

**Buying MSX at the moment is buying a computer with a future. At present MSX is still getting established, and if you want access to a wide range of software and peripherals, micros such as the Spectrum + and Commodore 64 may be more attractive. But, even if you are buying just the computer, MSX computers compare very favourably indeed. They may not have the glamour of the latest machines, or the following of older machines, but for the first time you can buy a computer made for everybody, not just buffs and whizzkids.** ■













| COMPUTER | ACORN ELECTRON | AMSTRAD CPC464 | COMMODORE 64 | MEMOTECH MTX512 | SINCLAIR SPECTRUM+ | SONY HITBIT |
|---|---|---|---|---|---|---|
| PRICE | £129 | £349 | £190 | £275 | £130 | £300 |
| CPU | 6502 | Z80A | 6510 | Z80A | Z80A | Z80A |
| CLOCK | 2MHz | 4MHz | 1MHz | 4MHz | 4MHz | 4MHz |
| RAM | 32K | 64K | 64K | 64K | 48K | 64K |
| ROM | 32K | 32K | 20K | 24K | 16K | 32K |
| FREE RAM | 9-21K | 42K | 38K | 64K | 41K | 28K |
| KEYS | 56 | 74 | 66 | 79 | 57 | 74 |
| CURSOR PAD | Yes | Yes | Yes | Yes | No | Yes |
| FUNC KEYS | 10 | 12 | 4 | 8 | 0 | 5 |
| USERDEF | 10 | 32 | 4 | 8 | 0 | 5 |
| NUM. PAD | No | Yes | No | Yes | No | No |
| MAX TEXT | 80×32 | 80×24 | 40×25 | 40×24 | 32×24 | 40×24 |
| MAX PIXEL | 640×256 | 640×200 | 320×200 | 256×192 | 256×176 | 256×192 |
| COLOURS | 8 | 27 | 16 | 16 | 16 | 16 |
| SPRITES | 0 | 0 | 8 | 32 | 0 | 32 |
| RGB | Yes | No | Yes | Yes | No | Yes |
| VOICES | 1 | 4 | 4 | 4 | 1 | 4 |
| HIFI OUT | No | Yes | Yes | Yes | No | Yes |
| SPEAKER | Yes | Yes | No | No | Yes | No |
| MAX BAUD | 1200 | 2000 | 1200 | 2400 | 1500 | 2400 |
| JOYSTICKS | 0 | 2 | 2 | 2 | 0 | 2 |
| CENTRONICS | No | Yes | No | Yes | No | Yes |
| RS232 | No | No | No | No | Yes | No |
| EXP PORT | Yes | Yes | 2 | No | Yes | 2 |

# The new Mitsubis

# For those in the know

Anyone conversant with home computers will know precisely why MSX was worth waiting for.

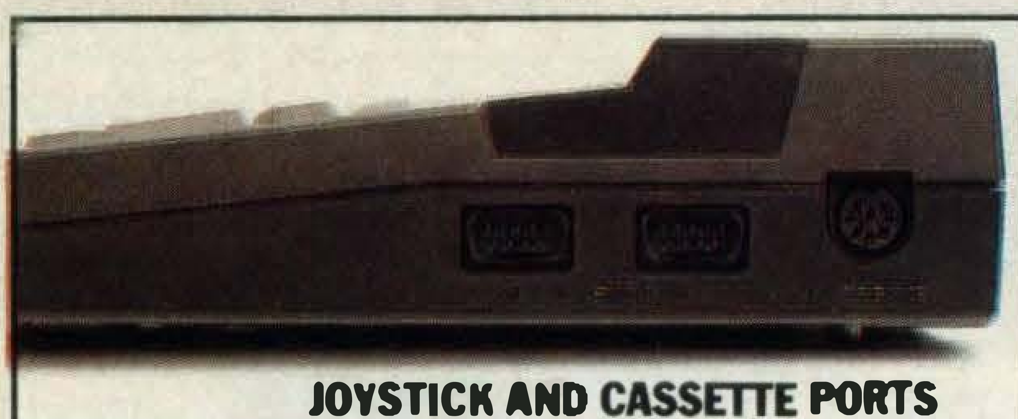
The sheer proliferation of computer and software systems flooding the market loudly underlined the need for a unified standard.

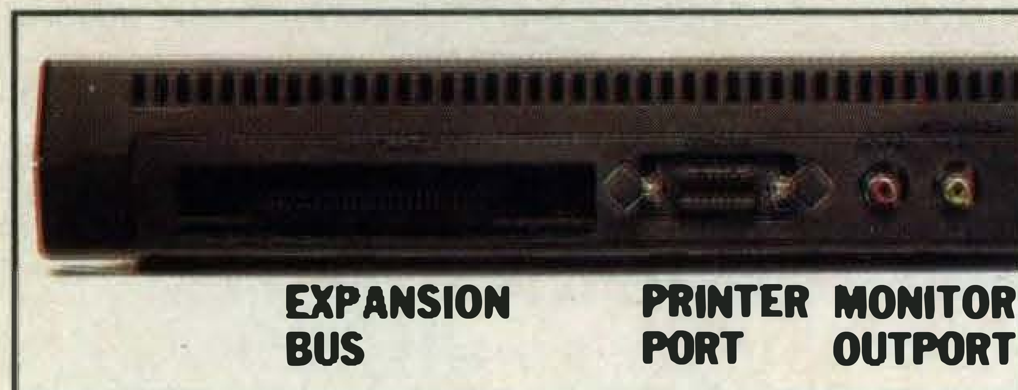
So the major companies jointly developed a single computer and software system. The result – MSX – the format that will be standard for all time.

And those in the know will not be surprised that Mitsubishi are in the vanguard of the MSX movement. For, with the F-series, Mitsubishi offers everything that MSX is and more.

## GRAPHICS

Maximum resolution of 256 x 192 pixels with all 16 colours available on the screen at the same time. 32 sprites in two sizes and two magnifications allowing easy creation of '3D' graphics. 255 pre-defined characters all of which can be used as straight text or easily mixed with graphics.


JOYSTICK AND CASSETTE PORTS


EXPANSION BUS
PRINTER PORT
MONITOR OUTPORT

## SOUND

Three independent channels which can be output through the TV loudspeakers at any volume, individually or simultaneously, at any of the available 8 octaves. All three channels can use the 'noise' generator for stunning sound effects.

## KEYBOARD

73 moving keys, ergonomically designed for many hours of fatigue free use. Large cursor control keys which are excellent for both programme editing and game playing. 5 function keys giving 10 pre-defined functions which can easily be redefined from 'BASIC' using the 'KEY' command.

## BASIC

MSX BASIC is possibly the most comprehensive version of the original language. There is a complete set of commands for creating graphics and sounds, manipulating text and moving sprites. In addition to this there are 'built-in' interrupt routines for detecting sprite collisions, function key selections and joy-stick fire buttons.

## EXPANSION

The Mitsubishi 64k ML-F80 and 32k ML-F48 are both equipped with 2 cartridge ports, 2 joy-stick ports and a centronics compatible parallel interface. It is through these devices that the MSX system can be expanded for use with disc-drives, printers, serial interfaces, modems and other peripherals.

## SOFTWARE ON CASSETTE

The MSX system can load and save data onto cassette at 1200 or 2400 baud and unlike certain other home computers, the Mitsubishi F-series can be used with a normal domestic tape recorder for this purpose.

When you put all of these features together, with the knowledge that Mitsubishi is the largest manufacturer of Mainframe computers in Japan, those in the know will immediately recognise the true potential of the Mitsubishi F-series.





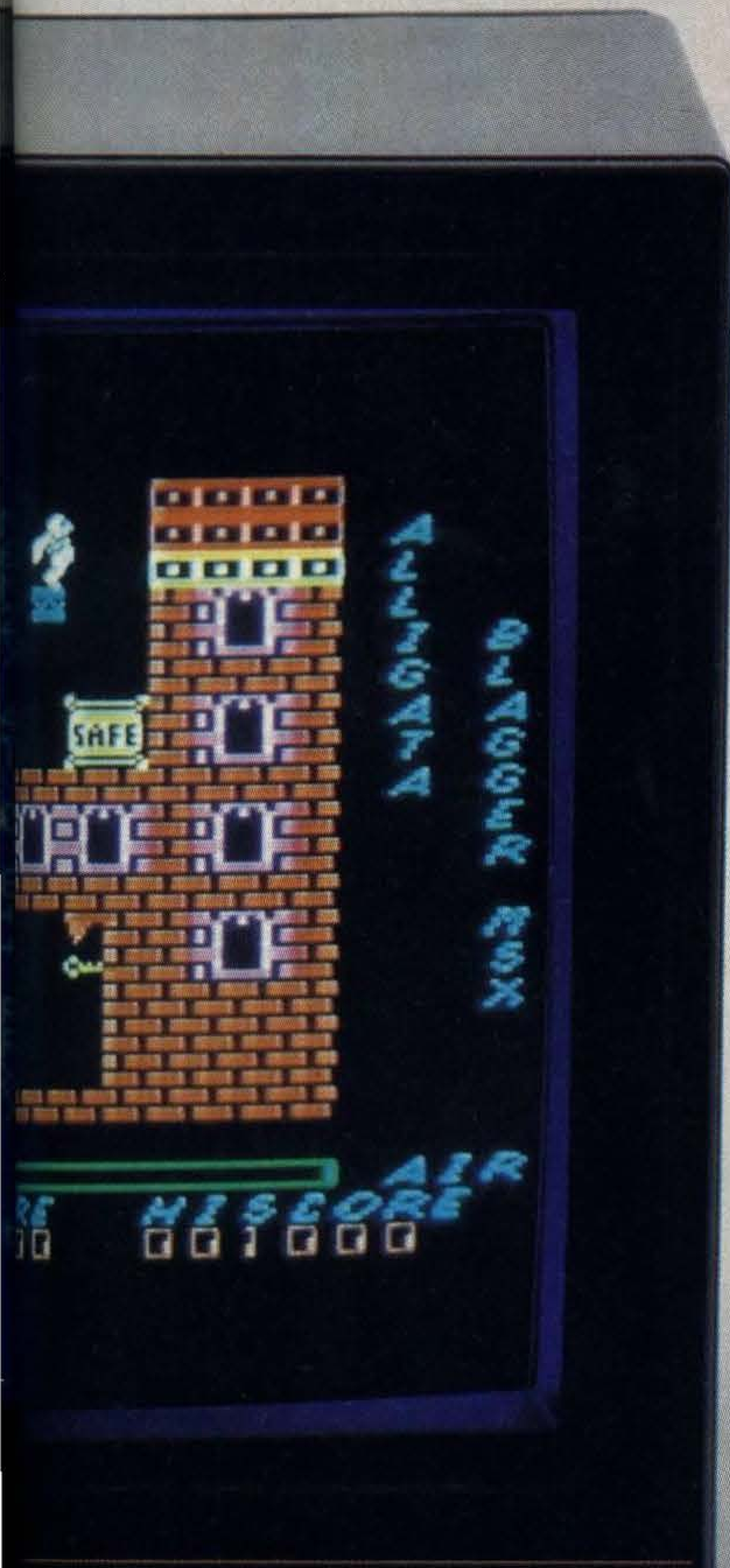

# MSX Computers

# For those who aren't

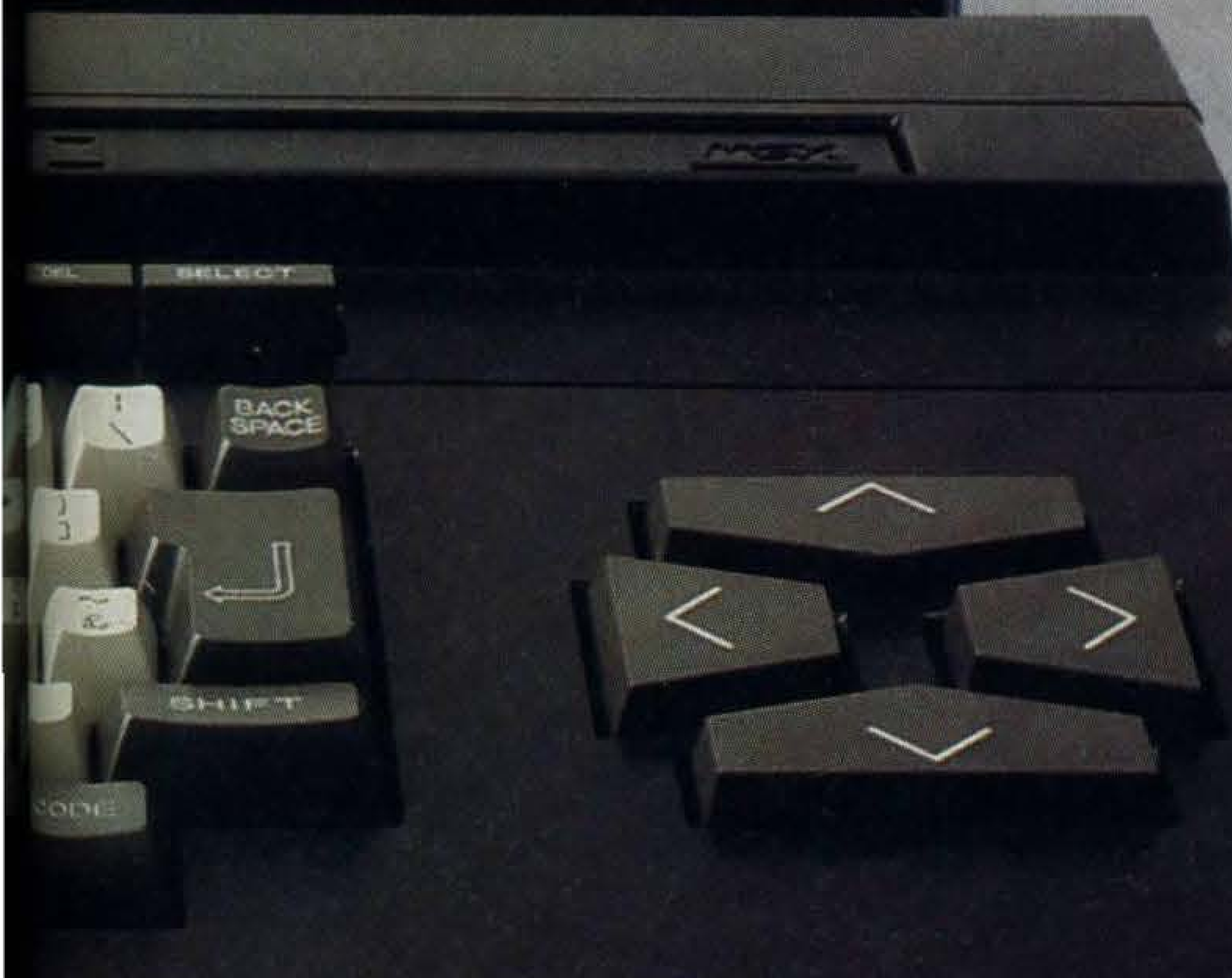
The Mitsubishi MSX family computer is everything you wanted to know about computers, but didn't know who to ask.

It's friendly, it's fun and so simple, a grown man can use it. Yet so versatile even his computer-versed children would be hard-stretched to over-tax it.

It operates with any colour TV set. Just plug it in, and the full power of the computer is instantly at your fingertips.




ML-F80




## FOR FATHER

The Mitsubishi MSX can do many things, from keeping a simple check on the bank balance to running a complete business with customer account files, stock control programmes and word processing. It is just as much at home keeping control of your record or stamp collection or playing 'strategy' games such as chess, othello or contract bridge.

## FOR MOTHER

There is the opportunity to store recipes and other household information or keeping record of the children's progress at school. Household accounts can also be recorded so that savings can be planned for holidays and other seasonal expenses.

## FOR THE CHILDREN

There is education, particularly computer education. In a world where computer literacy is now of foremost importance, MSX offers a broad base of educational software. With simple programmes for the very young through to complex programmes for older students like language learning.

Also, the graphics system of the Mitsubishi computer ensures that the MSX versions of your favourite games are reproduced with incredible speed and accuracy.

Undoubtedly, MSX is the format for the future, and will become the byword for computer education and entertainment.

And you can be secure in the knowledge that regardless of future developments, any investments made in MSX hardware, software and peripherals today will always be compatable with the Mitsubishi F-series.

So if you've waited until now to buy a computer, you couldn't have timed it more perfectly. Get to know one today.




Mitsubishi Electric (UK) Ltd., Hertford Place, Denham Way, Rickmansworth, Herts WD3 2BJ. Tel: 0923 770000.

### SPECIFICATIONS

**CPU:**
Z80A (3.6 MHz)
**Memory:**
ROM: 32 KB
RAM: 64 KB (F80)
RAM: 32 KB (F48)
Video Ram: 16 KB
**Screen Displays:**
*Text Mode:
40 columns x24 lines
*Graphics:
256 x 192 pixels
Colours: 16
(15 + transparent)
Sprites: 32
Output: RF, Composite Video
**Keyboard:**
73 moving-key keyboard
5 function keys
Cursor control keys
Special keys for screen editing
**Sound:**
8 octaves
3 channels for sound or 'noise'
Output by TV sound or External Audio Amplifier
**Cassette Interface:**
1200-2400 baud
Motor controlled by CPU
**Parallel Interface:**
Centronics
**Joy-Stick:**
2 x 9 pin connectors
**Rom-Cartridge:**
2 x 50 pin connector

*Subject to Scan of Monitor

ML-F48



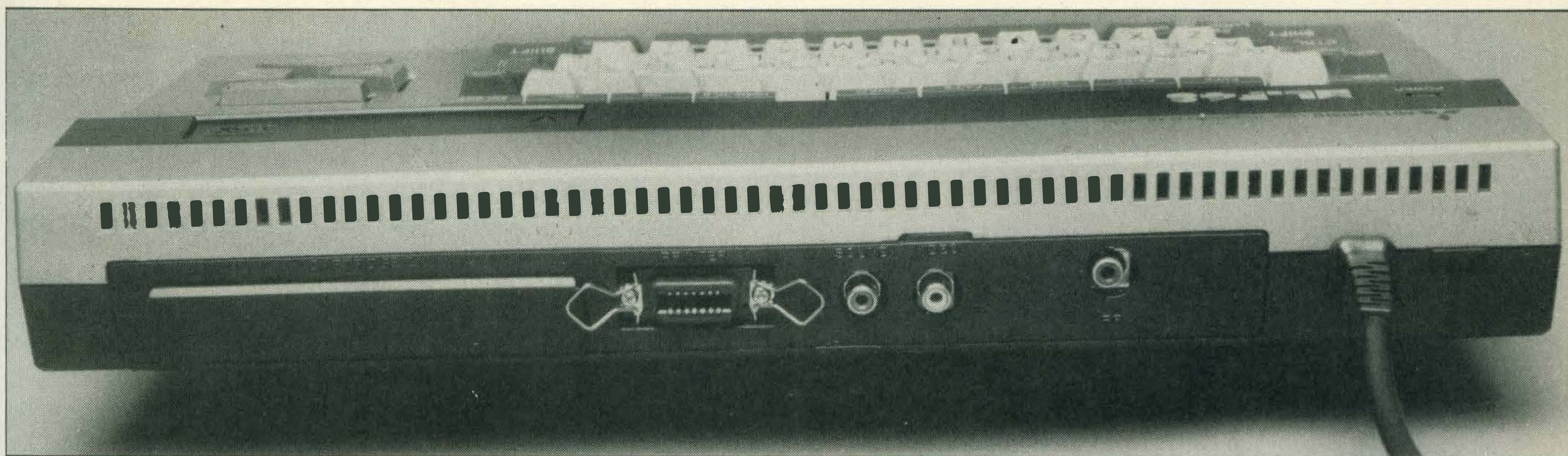
MSX

# 32K – THE PRICE YOU PAY




**Mitsubishi's 32K micro is the least expensive Japanese MSX. 32K is not much of a handicap**

**MITSUBISHI ML-F48**
**£225.00**



There's no shortage of interfaces along the back of the ML-F48. Grill is for cooling, but it looks good too. Note the cover on the cartridge port

**Britons, it is thought, are obsessed by numbers. That's why, when the Japanese were planning their MSX invasion, they were convinced that only computers with 64K of memory had a chance of selling. One company, Mitsubishi Electric, weren't quite so sure of this though, and they have hedged their bets by bringing in a less expensive 32K MSX computer, the ML-F48.**

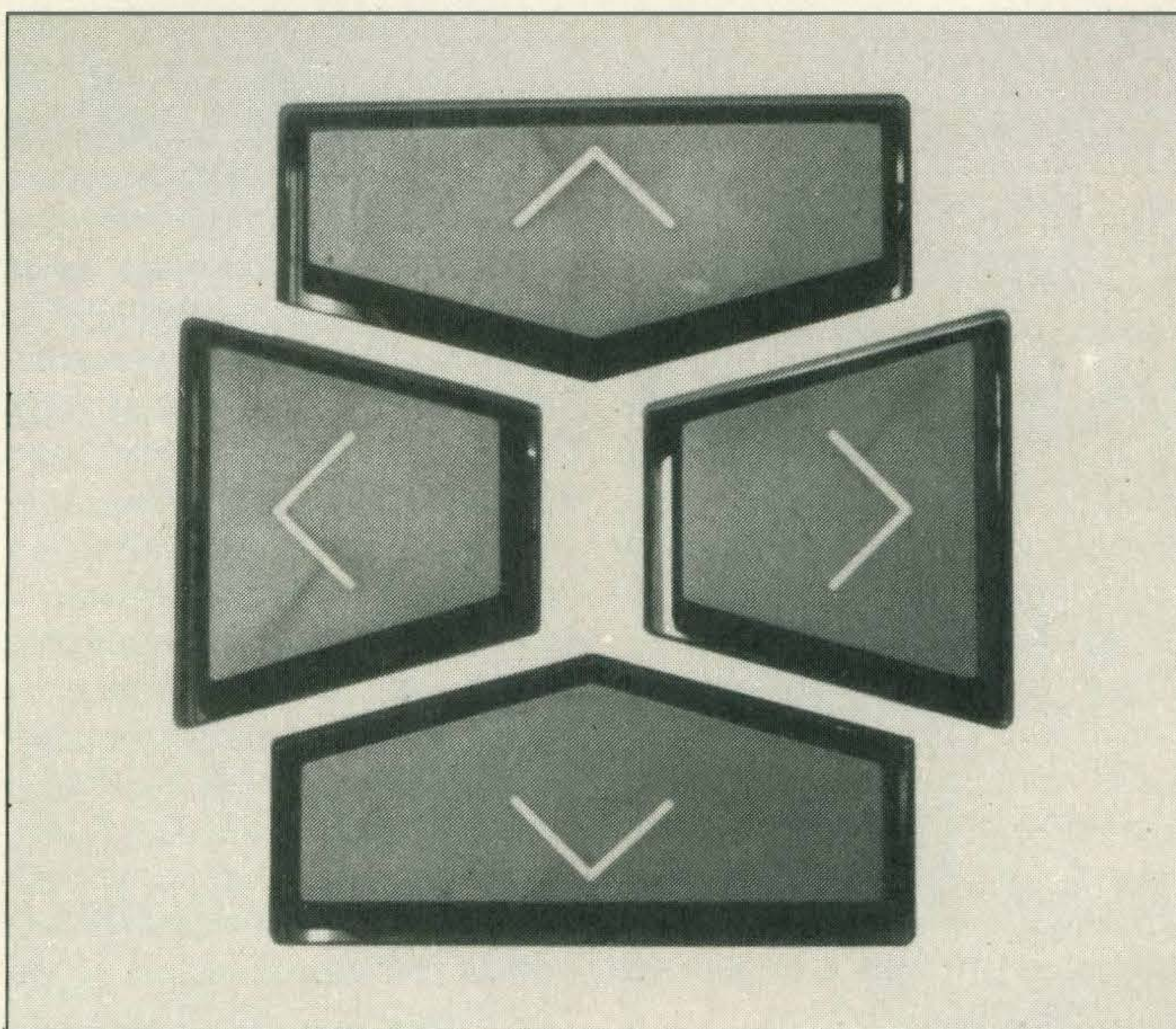
In Japan there is nothing sacrosanct about the 64K computer. In fact, 64K is the exception rather than the norm. Most of the MSX machines on sale are 16K or 32K, and there is even an 8K Casio computer. A shortage of memory certainly hasn't hampered sales.

In the UK, 64K machines started arriving with price tags of around £300, though non-Japanese 64K machines could be bought for less. The £300 price has been a bit of a handicap, with the most popular non-MSX micros priced at £200 or less. The ML-F48 is priced at a more affordable £225 and comes with £45 worth of free games software.

It has all the features and frills of its ML-F80 big brother. What it's not got is 64K of RAM. The question in the minds of potential purchasers will be "What does this shortage of memory mean?"

To look at the ML-F48, there's little to make you think it was any different to other MSX computers. Cosmetically it differs dramatically from the 64K version, though the casings are identical.

The 64K Mitsubishi is finished in pedestrian black with white and grey keys. The 32K version has a snappy silver case, emblazoned with a black band and with keys in off-white or mid-grey. To our eyes it is certainly one of the better looking MSX machines available.



Cursor keypad is fine for games players — the keys are this size

It is supplied with a remote control cassette lead, an RF lead to connect to the TV's aerial socket, a sumptuous 304 page manual and a complementary cassette with two games and a demo program on it. There's also that six pack of popular games.

## 'To our eyes it is certainly one of the better looking MSX machines available'

The manual doubles up for the two computers. At no point does it indicate any different procedures for the 32K machine. At this stage, you must be beginning to think that there is no difference, except in one specification and a price figure.

Powering up tends to confirm this. The message '28815 Bytes free' appears in white letters on the blue screen. That's the same message as you'll get from a 64K MSX when it is switched on. Something fishy is going on.

It is all to do with how the available memory is used. For that, it is necessary to delve into the interior of the Mitsubishi.

Six screws hold the top on. Inside is a neat, well-assembled collection of silicon chips, resistors, diodes, transformers and output devices. A large number of the chips are of Mitsubishi's own manufacture and there are no EPROMs. A plastic hood protects the electronically dangerous parts and a large metal plate helps support the keyboard.

There seems to be no shortage of components, no place where 32K of RAM chips has been left out. You might expect the ML-F48 to be the same as the ML-F80, but with a few ICs less.

The ML-F48 is a different animal entirely. It uses an older type of chip, the four by one bit chip, instead of the more expensive sixteen by one bit chip of the 64K computer. The older chips need a higher voltage and more of them are needed to do the same job. It means that the PCB is totally different, and the two Mitsubishi computers bear little internal resemblance. So much for our ideas of a stripped down 64K computer!

## 'At the moment there is no disadvantage to the ML-F48 for BASIC users'

32K doesn't impose much restriction on the programs you can write or run. That is largely because of the inefficient way memory is used in the 64K machines.

In a 64K MSX 32K of the available RAM is overlayed by the 32K BASIC. This leaves 32K for BASIC programs, though in practice the amount is 28K, as some memory is needed to keep track of variables and so forth. The ML-F48 has the same memory in BASIC, with the BASIC butting onto the RAM. If you don't have enough room for your BASIC programs on the 32K machine, you won't get any more room by buying a 64K machine. Mind you, plans for 64K MSX with virtually 64K of user memory are well advanced. At the moment, there is no disadvantage to the ML-F48 for BASIC users.

A difference may become apparent if you try and load large quantities of Machine Code. Here the full 64K of a 64K micro becomes available,

so twice as much code can be stored.

We tried out a wide variety of commercially produced Machine Code programs on the ML-F48. Level Nine adventures loaded and ran perfectly. Arcade games gave no problems. The only non-runner was The Hobbit, Melbourne House's sophisticated adventure. It had too much code to fit the Mitsubishi. However, a game of this complexity is very rare indeed, and the programs that won't fit the ML-F48 will be miniscule in number.

We haven't had any sophisticated Machine Code business packages yet, and this might be another area of limitation. With a word processor or database that held data in Machine Code format, and used no BASIC, a 64K machine would hold considerably more than this computer.

Cartridge software poses no such problem, as it contains its own ROM, and operates independently of the MSX memory. On the software front, the 32K RAM seems to be a relatively insignificant shortcoming.

There will be a problem if you want to run MSX-DOS and CP/M software. This needs a full 64K of memory, so can't be run on a 32K MSX. MSX-DOS BASIC will operate quite happily though, so you can use a disk drive to store programs and data.

So, we have a £225 computer that on the face of it is almost as good as rivals costing £75 more. Is the ML-F48 as good a bargain as it seems?

You'll need a cassette recorder, television and plug to get going. MSX computers don't have too many problems loading programs from cassette, given a decent recording. The cable provided has a remote control jack too.

**'The free commercial games supplied are in a different league entirely'**

Running the demo program gives a good idea of what an MSX computer can do. Graphics and sound are ably demonstrated, add-ons explained and uses suggested.

The two sample games on the demo cassette are pretty naff. Breakout is a simple version of the once upon a time arcade favourite. Othello is a strategy game that is more playable but only a little more exciting than checkers.



Five function keys double up to give ten user definable operations

The free commercial games are in a different league entirely and you'll find some reviewed in this issue. Blagger is a platform game, with your character collecting keys. Chuckie Egg is another classic platform game. Eric and The Floaters is an amusing maze game and Mr Wong's Loopy Laundry is another variation on the platform theme. Les Flics put you in the role of the Pink Panther, while Shark Hunter casts you as an Eskimo. All these games are of a very high standard and an excellent start to any collection of software.

Playing the games and entering BASIC programs will show you how good the Mitsubishi keyboard is. The keys are slightly scallopped, angled pleasantly upwards and clearly marked. They have a solid feel too, unlike the mushy or bouncy feel of other keyboards. Word processors will find the Mitsubishi ML-F48 a joy to use.

The Mitsubishi has a full complement of keys — 48 alphanumeric, 21 control keys and a cursor keypad. One key, marked with Continental accents is inoperative, presumably because it is not needed by English programmers.

Control keys are accessible enough. The CAPS LOCK has a red lamp indicating it is set. The return key is easily the largest on the board and the space bar is large enough for touch typists. Reaching CTRL and STOP with one hand is simple too, unlike on some other MSX computers. Power on is shown by a green light next to the ML-F48 logo. There's an on/off switch on the left of the casing.

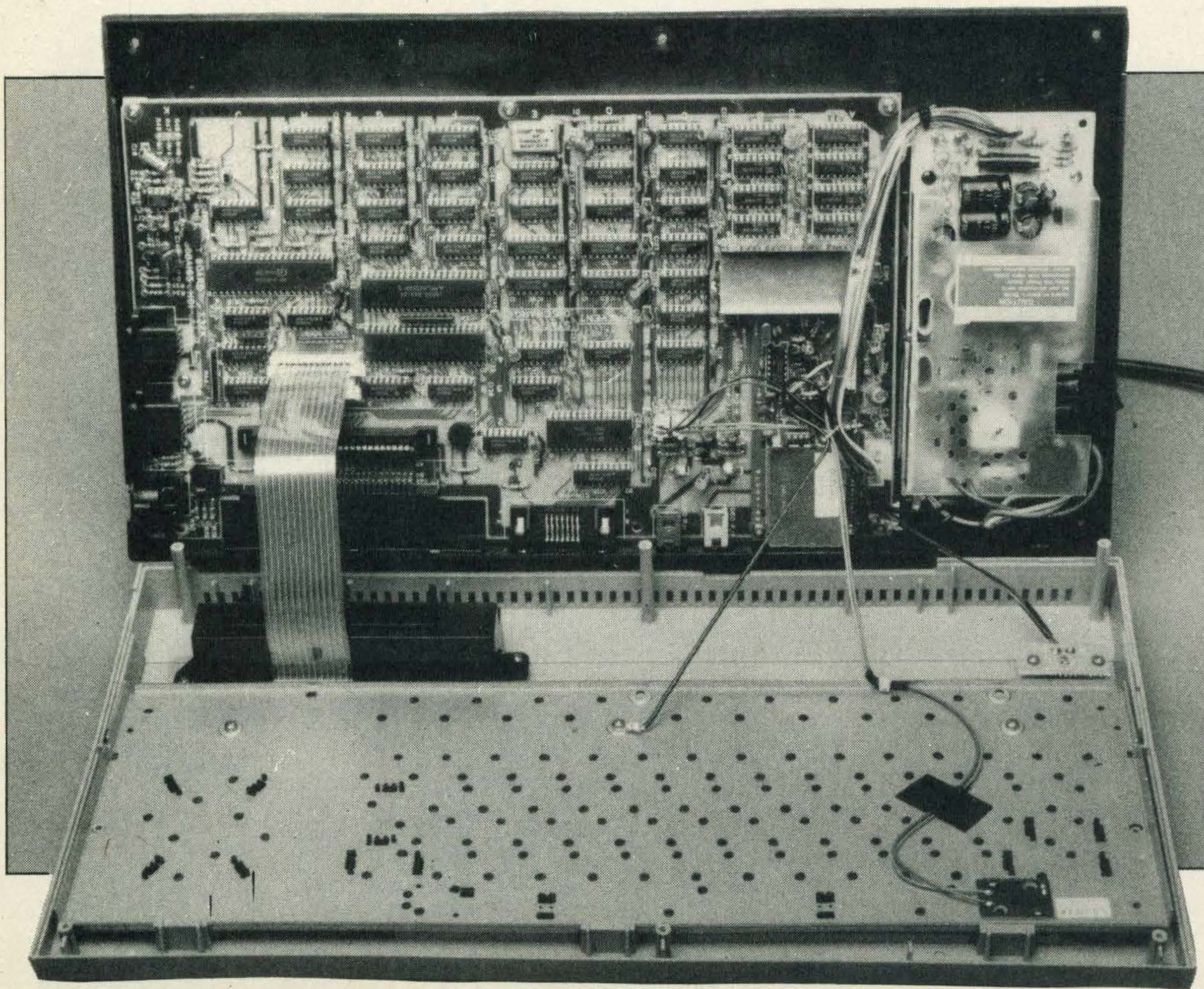
The function keys are a little on the small side, and the use of more colour to pick out key controls would be an improvement as would the addition of a reset button. Still, by current standards, the ML-F48 keyboards is very good indeed.

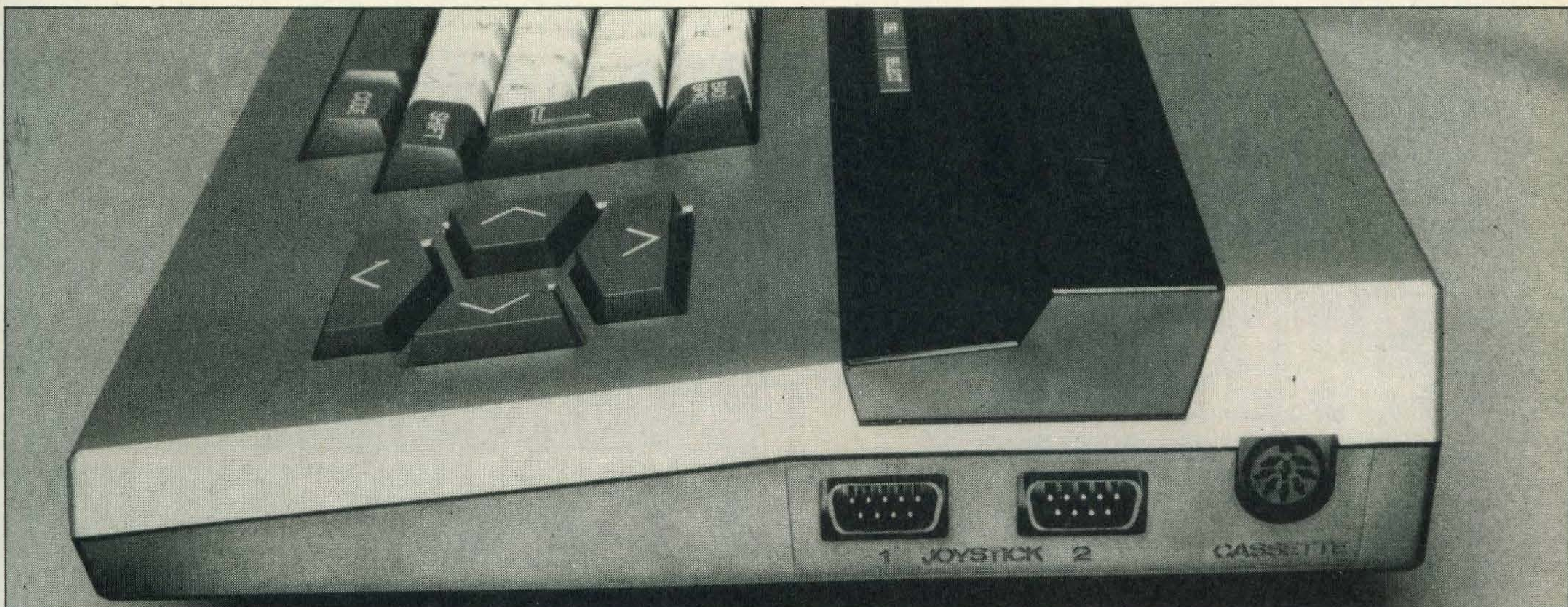
The cursor keypad is four separate keys with a long travel. For fast games this is a disadvantage, and a joystick will make life easier.

All the usual interfaces are provided. Two joystick ports are on the right hand side of the case. Mitsubishi have their own joysticks at around £15, though virtually any joystick can be fitted.

Next to the joystick ports is an eight pin DIN socket for cassette players, enabling full remote control with the supplied lead.

Along the back is a permanently connected power


Inside, the ML-F48 is very different to the ML-F80 and built to the highest standards




**Two joystick ports and the cassette interface are on the right hand end of the ML-F48. Note the attractive two tone finish too**

cable and three phono sockets for RF (television), audio and video output. They are clearly marked. Then there's a locking parallel Centronics printer interface and a covered cartridge port. A second cartridge port, with flap, is on the top of the case. Both ports will take a cartridge or cartridge port fitting peripheral.

We tried out the Sanyo lightpen and the Sony disk drive on the 32K Mitsubishi. In both cases the verdict was the same — no problems. That's a good demonstration of MSX compatibility too— Mitsubishi computer, Sanyo lightpen and data recorder, Sony disk drive and Microvitec monitor. Contrary to the claims of sceptics, compatibility is a fact of life in the MSX world. The fact that the ML-F48 is only 32K is no disadvantage to this.

## LIKES

- Good value for money
- Quality of construction
- Supplied software
- Keyboard action

Performance is first class. Even when left switched on overnight, there is no abnormal overheating. A well-grilled case sees to that. Picture and sound quality is more dependent on the quality of the television, though for optimum results, you'll need a monitor and a HiFi system.

Documentation is fine. The 304 page manual details each BASIC command, with example programs, grouped together under files, graphics, sound and so on. There's a good overview of the system too, and the language is not too patronising. Appendices detail control codes, error messages and entry points for BASIC routines — good, useful information.

All in all, the ML-F48 has plenty going for it. The fact that it has 'merely' 32K of RAM is no handicap unless you are loading programs with more than 32K of code (very rare at the moment), or using coded business programs, in which case you won't be able to hold as much information or wanting to run CP/M software with a disk drive. All available peripherals will fit, all cartridge software will run. Until we get true 64K machines, you might as well save money and stick to 32K, if you want a quality Japanese machine and pennies are short.

## DISLIKES

- Limitations of 32K
- No reset switch
- Demonstration games

# Verdict

**As you are getting over £45 worth of games software with Mitsubishi computers, the price is even more reasonable. Shopping around may well yield prices of less than £225. Our verdict has to be that the ML-F48 is an MSX computer with plenty going for it and excellent value for money to boot.**

# MITSUBISHI ML-F48 £225

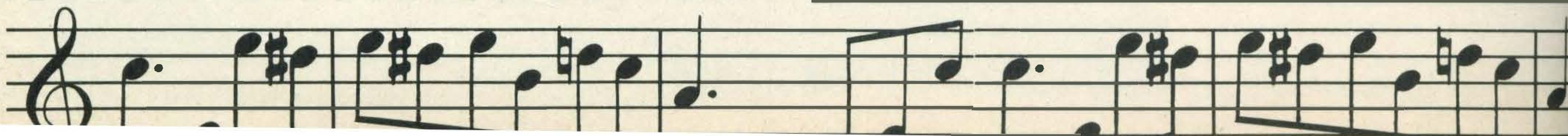
## SPECIFICATION



| | |
|---|---|
| **CPU** | Z-80A equivalent (3.6MHz clock) |
| **MEMORY** | |
| **RAM** | 32K |
| **ROM** | 32K MSX BASIC |
| **VIDEO RAM** | 16K |
| **KEYBOARD** | |
| **TYPE** | Full travel |
| **KEYS** | 48 Alphanumeric<br>21 contol keys<br>Keypad cursor control |
| **NUMERIC KEYPAD** | No |
| **VIDEO DISPLAY** | |
| **TEXT** | 40 characters × 24 lines |
| **GRAPHICS** | Maximum resolution 256 × 192 pixel |
| **COLOURS** | 16 |
| **SPRITES** | 32 |
| **OUTPUT** | TV<br>Monitor |
| **SOUND** | |
| **GENERATOR** | 3 channels with 8 octave range |
| **OUTPUTS** | Mono audio output (RCA phono) 150mV/10kOhm Standard |
| **INTERFACES** | |
| **JOYSTICKS** | 2 Atari standard |
| **EXPANSION BUS** | No |
| **CARTRIDGE PORT** | 2 |
| **PRINTER** | 1 × Centronics |
| **SERIAL PORT** | No |
| **CASSETTE** | 8-pin DIN |
| **RESET** | No |
| **DIMENSIONS** | 370 × 270 × 70mm (W × D × H) |
| **WEIGHT** | 2.7kg |
| **POWER SUPPLY** | Internal, captive mains lead |
| **FINISH** | Black/silver plastic case, grey keys with black lettering |
| **SOFTWARE INCLUDED** | Demo + 2 games, Blagger, Les Flics, Mr Wong's Loopy Laundry, Eric and The Floaters, Chuckie Egg, Shark Hunter |
| **SUPPLIED ACCESSORIES** | 1 RF cable<br>1 cassette lead<br>Instruction manual |
| **DISTRIBUTOR** | Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD<br>Tel: 0923 770000 |

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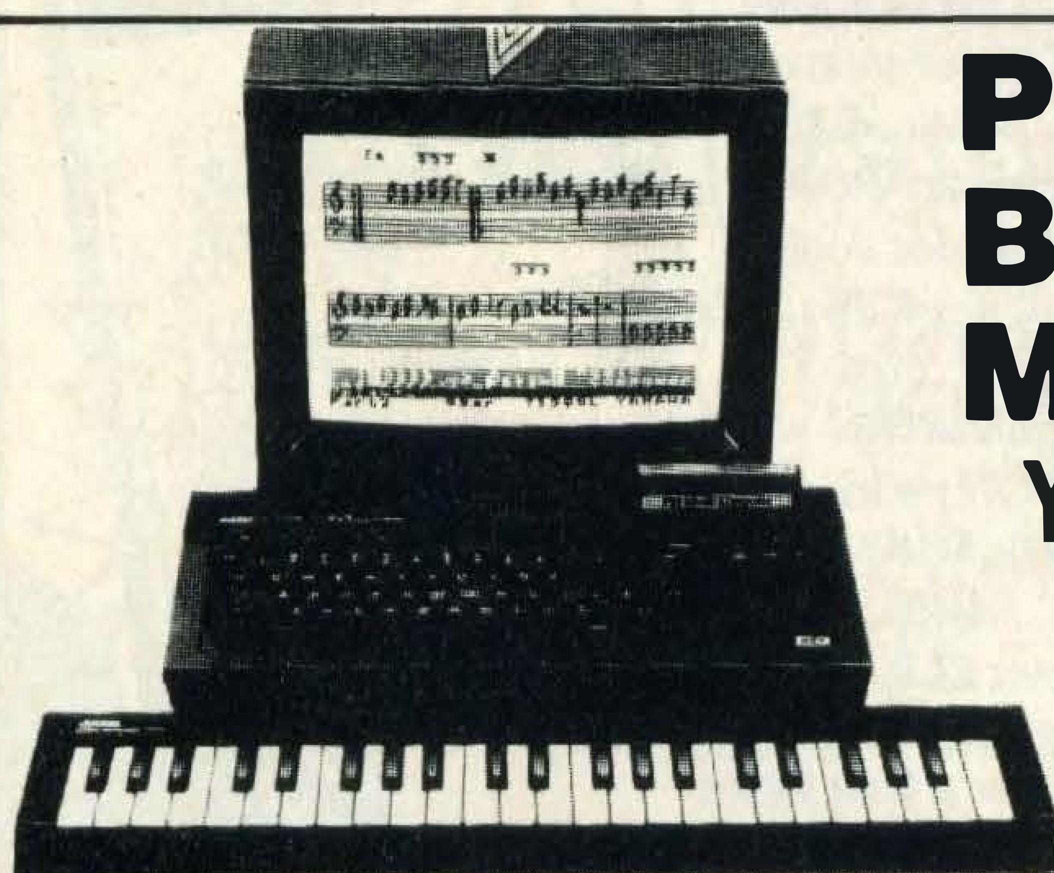
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| 17 St Mary's St<br>Edinburgh<br>Tel:<br>031-557 3986 | 90-94<br>Saltmarket<br>Glasgow<br>Tel:<br>041-552 6825 | 40 Mitchell St<br>Kirkcaldy<br>Tel:<br>0592 260293 | Elgin Street<br>Dunfermline<br>Tel:<br>0383 733353 |

**No. 1 for YAMAHA Hi-Tech in Scotland**

## Grants

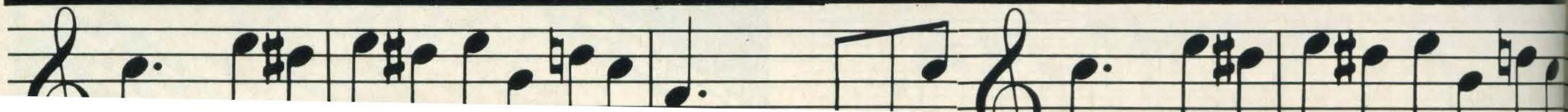
*Call in for a demo or further information on the*

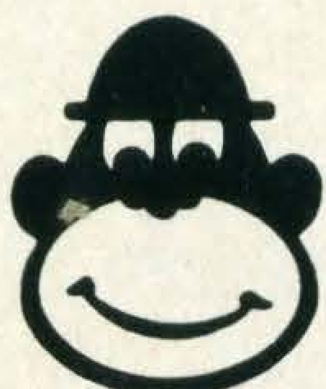
**YAMAHA CX5M**
Music Computer

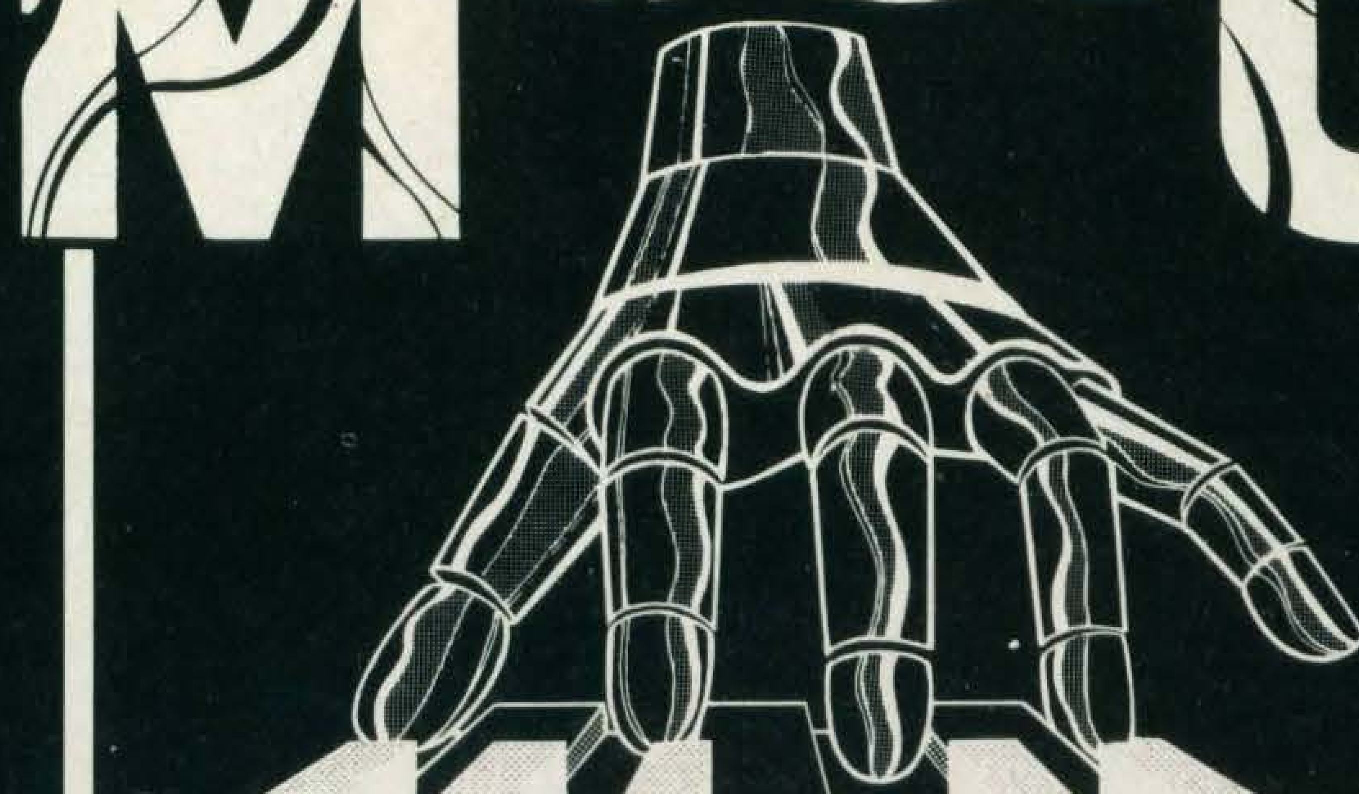
**404 Byres Road**
**Glasgow G12 8AF**
**Tel: 041-339 3618**

**53-53A Home Street**
**Edinburgh EH3 9JP**
**Tel: 031-228 1704**

**DEALERS IN MUSIC TECHNOLOGY**







THE MUSIC
VILLAGE






# MACHINE MACHISMO

New from Panasonic is the good looking CF2700 64K micro. It seems to make a formidable package




PANASONIC CF2700
£280.00

**There it sat, glaring gleefully at the passing shoppers with a colourful demonstration program cycling endlessly in the background. Onlookers gathered, overawed by the machismo of this latest arrival on the MSX scene. It is the Panasonic CF2700 Personal Computer, and for just £280, it could be making your other domestic appliances reach for their Bullworkers.**

Panasonic is pretty much a household name in this country. They make video recorders and cameras, televisions, hi-fi and portable sound systems, car audio systems, calculators, batteries and business equipment. The parent company also makes goods under the National and Technics names — microwaves, shavers, vacuum cleaners and electric organs. It is a diversity typical of many MSX makers.

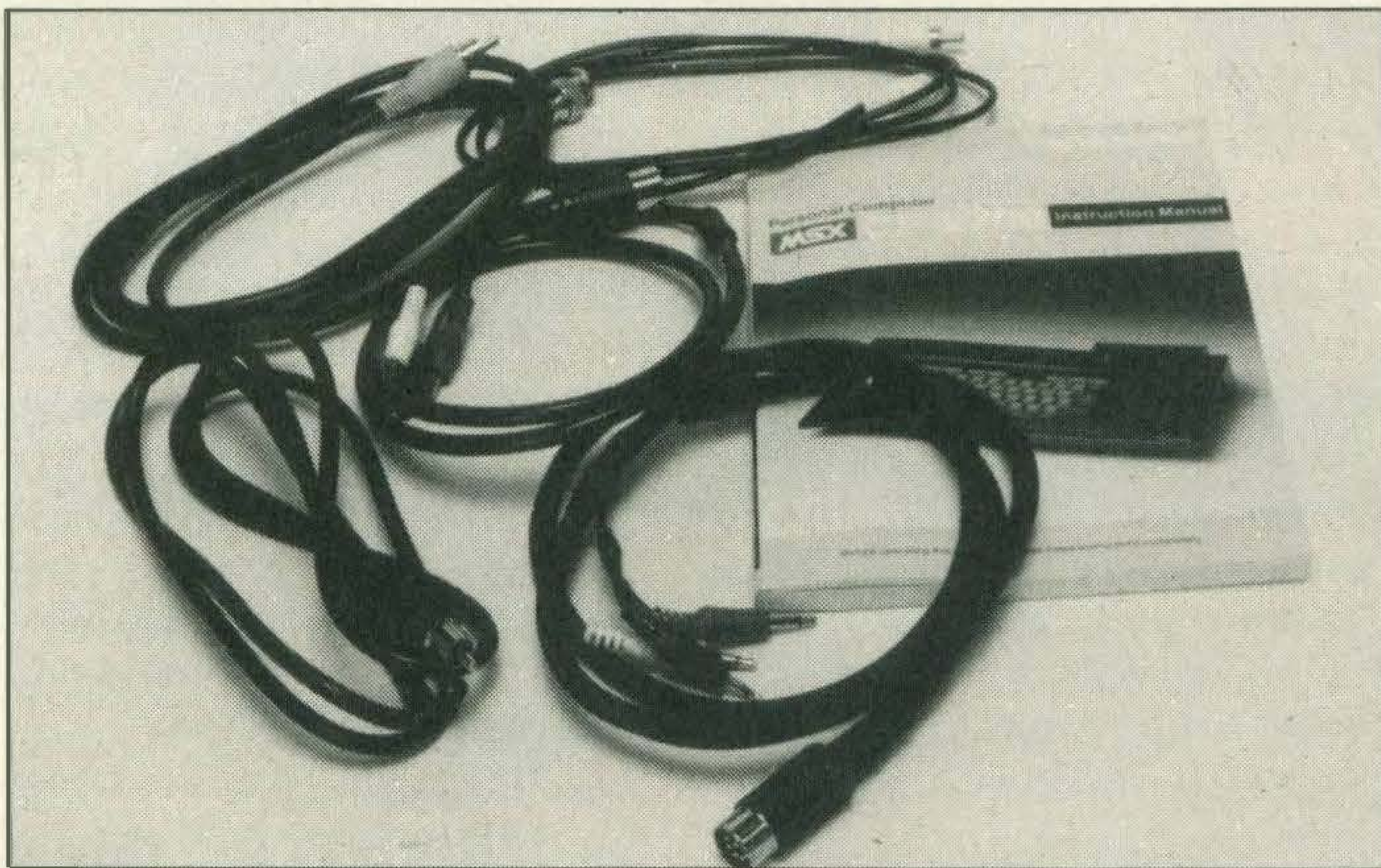
The parent company goes under the name of Matsushita Electric and was formed in 1918. They've built a solid reputation for high quality products and innovative developments. Other MSX companies are going to have to watch their backs if Panasonic get aggressive.

For their first MSX computer, Panasonic have followed the crowd, producing a 64K computer with the established range of features and at a middling price. They have also launched another variant of the MSX joystick, and a data recorder. We've been looking at the three items.

The first thing to strike you about the Panasonic is its appearance. It is considerably larger than any of the other MSX micros we have seen. Physical measurements are a width of 426mm, a depth of 249mm and a height of 91mm. It weighs over 3.5 kilograms.




**RQ8100 data recorder is battery powered, compact and costs £44.50**




**Plenty of cables come with the CF2700, including a BNC video cable**

The top plate is dominated by two cartridge slots. The casing is matt black, the keys mid and light grey, with white lettering. Mute green arrow keys and the machine logo form the only colour relief.

The appearance is aggressive and business-like. This is not a computer for wimps. Such a stance is no bad thing in the MSX world. Most manufacturers are content to give their MSX micros a conservativage style likely to appeal to Mr and Mrs Average. The Panasonic is definitely the most distinctive MSX we have seen and likely to attract a lot of attention on the shelf. To our eyes it is ruggedly handsome — you must draw your own judgements.

Panasonic don't supply any free software with the CF2700, though their dealers may be making special offers. You do get a plentiful supply of cables though — a TV lead, a hi-fi lead, a remote contol cassette lead and a video cable terminating in a BNC connector, so you should be able to connect monitors such as the Microvitec Cub range without buying a separate lead. You also get an introductory manual, a BASIC manual and a sheet of graphics labels. You stick these to the keys so you can see what their graphic functions are at a glance.

Getting inside the Panasonic is relatively easy (though not recommended of course). The power transformer is inside and the power cable permanently attached. A heavy metal plate under the keyboard makes that part of the machine as solid as a rock. There's a large heat sink to absorb heat and a metal casing around the video display processor. This keeps out stray radio frequency (RF) signals that might affect the picture. It is a feature we've seen on no other MSX micro and a sign that Matsushita have really thought about quality control. All in all, the Panasonic must rate as the best built MSX micro we have yet seen. The extra size and weight this involves is no drawback.

The specifications vary not one iota from those of other 64K MSX computers. MSX BASIC occupies 32K of ROM, there's 16K of RAM for the screen display and a three tone, one noise sound generator. For graphics you have sixteen colours and up to 256 separate sprites. With BASIC in memory, users have around 32K for programs and data storage.

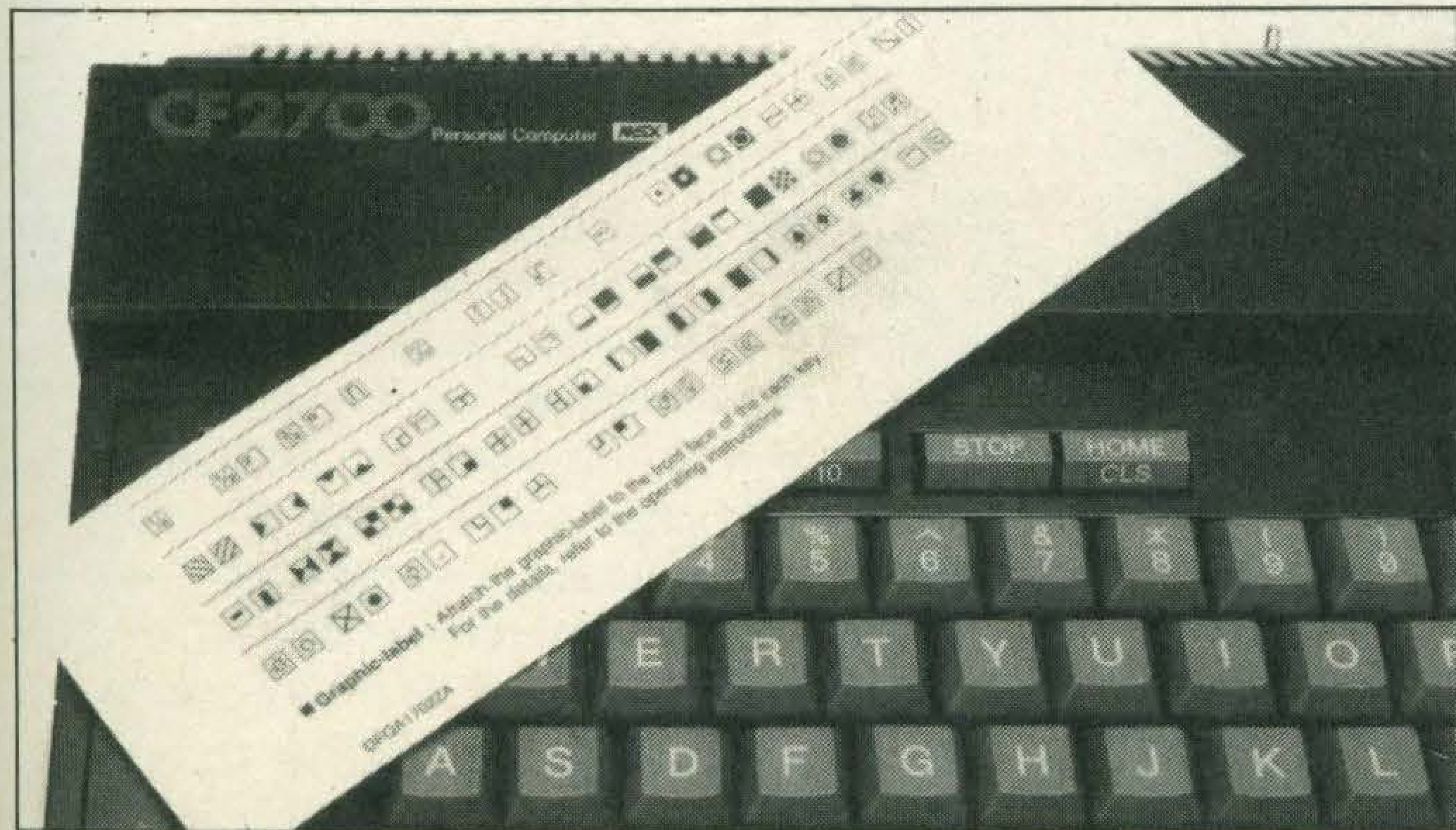
The BASIC includes sublanguages for sound and graphics, automatic line numbering, commands for using joysticks and other peripherals — you'll find more details of MSX BASIC in other articles. If you are new to programming, you'll find MSX BASIC easy to get on with and very user friendly. It has plenty of commands to allow programmers to incorporate joysticks, paddles, pads and other peripherals into programs and commands for structured programming, to get the most efficient programs.

Plenty of interfaces are provided. You can fit two joysticks, a Centronics printer, two cartridges or cartridge port interfacing devices, a cassette recorder, TV or monitor and hi-fi. Panasonic haven't broken any boundaries with their interfaces.

The keyboard has the usual array of keys — 48 alphanumeric, five function, 16 other control and a diamond of cursor control keys. They are well spaced, slightly scalloped and have a solid feel. Lettering is just printed on the keys, and with heavy use may start to wear off. A slightly more angled keyboard would help touch typing, but no computer is perfect.

What is usually a blank key on U.K. computers is marked with grave and acute accents on the Panasonic. Its use is explained early on in the manual, and the upshot is that you can quite easily type Continental texts.

The control keys rely a little too much on arrows to indicate




**Stick-on graphic symbol stickers are an excellent idea**

their functions. The shift, caps lock, backspace and return keys are all marked with slightly cryptic arrows. Still, they are in the right locations and you'll soon get used to the markings. There's a caps lock light too. Two shift keys and a nice long space bar make for good text entry, while ESC and STOP keys can be pushed with one hand.

The graphics stickers are a great idea. Stick them to the keys and you won't have to refer to manuals to find out how to get musical or other characters available by pressing the GRAPH key simultaneously.

Games playing with the cursor control keys is pleasurable. They have a middling amount of travel and will stand up to a fair battering.

The only omission from the keyboard is a reset key. Should a program crash irretrievably, your only course is to use the on/off switch under the left of the keyboard. It is a rocker switch that is not too easy to knock accidentally. There's a red power on lamp above the cursor keys.

The supplied instruction manual gives a good introduction to the CF2700. The keyboard and setting up is explained. Then it is on to entering programs and a brief overview of the main programming areas — maths, sound, graphics, program structure and so forth. Amusing diagrams illustrate the points made and there are short programs to try out. At the back there is a 17 page section of fairly detailed technical data about the computer.

The accompanying BASIC manual is a command by command survey of MSX

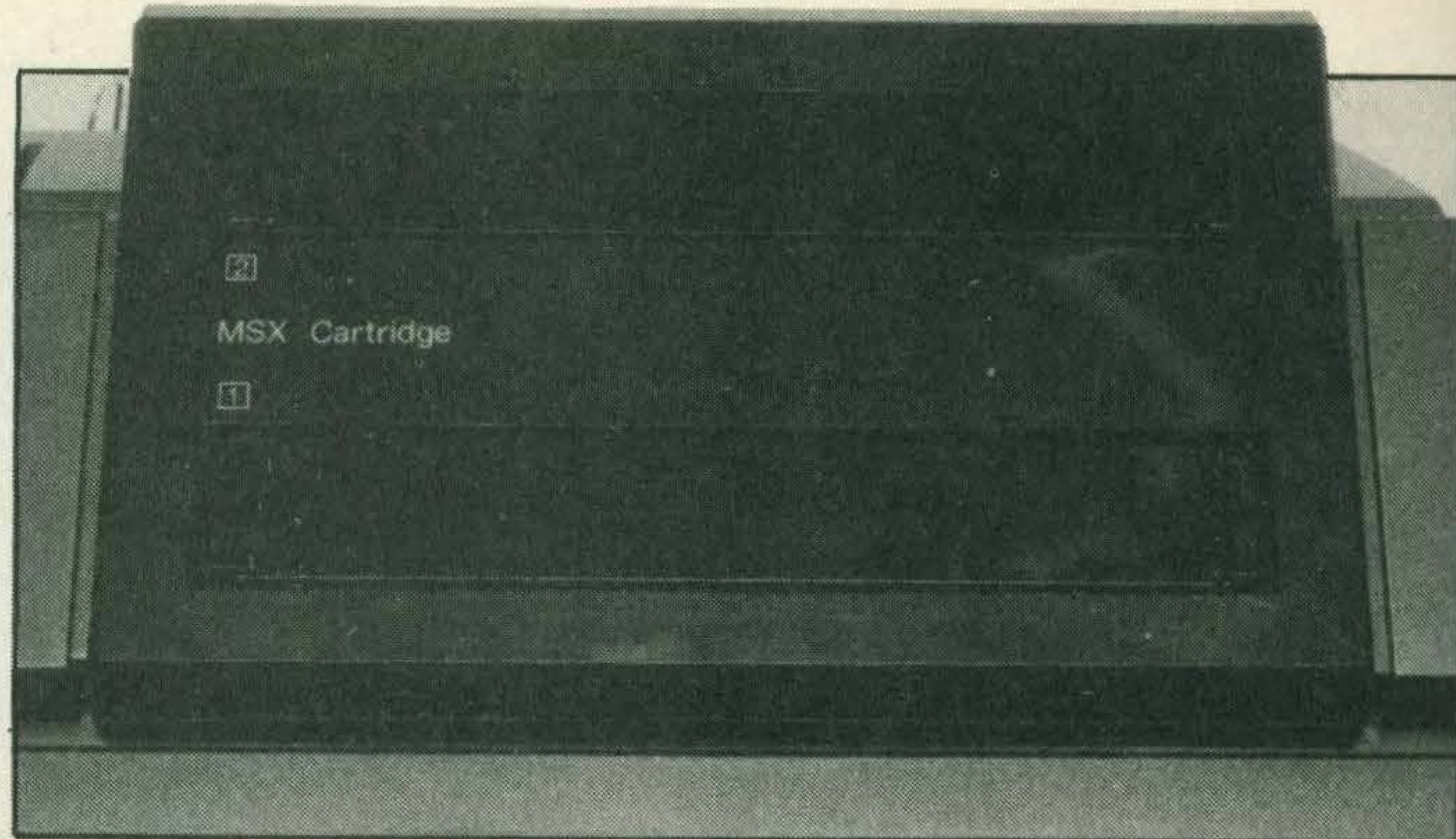


Panasonic's joystick is different

BASIC, with full explanations of each command. Between them, these two books should have you writing simple programs before very long. As for the lack of a demonstration tape, that is no great loss, as once they are viewed, such things are usually consigned to the back of a drawer. It's far better to try a few games or write your own programs.

All the ports on the Panasonic are capped or shielded to prevent dust entering. The two joystick ports are on the right hand side, beneath the cursor control keys. They are the standard nine pin Atari-type devices.

Cartridges go in one of the two flapped slots on the top of the CF2700. It doesn't matter which port you plug in to, though if you are using both ports, the number one port will take precedence. Manufacturers are now standardising on the cartridge-style 50 pin interface, rather than having two different types of 50 pin expansion ports. With some of the early MSX computers, you may find that you have only one port that will take all the



Two cartridge ports dominate the top of the Panasonic MSX micro

peripherals (light pens, disk drives and so on) being produced. You'll have no such problems with the Panasonic.

The Panasonic cartridge ports don't have a switch to reset the machine when a flap is opened. Remember to switch the computer off when changing cartridges, as it is possible to damage them by inserting them into a running machine. Still, prying fingers poking open a flap by mistake won't mean the loss of a valuable, unsaved program as the computer resets itself.

**'Panasonic aren't as yet producing a wide range of MSX peripherals, either here or in Japan'**

The rest of the interfaces are clustered on the back of the computer. There is a parallel Centronics printer interface for printers, an eight pin DIN socket for cassette recorders and sockets for audio, video and RF or television output. All are clearly labelled. The only thing missing is an RGB port.

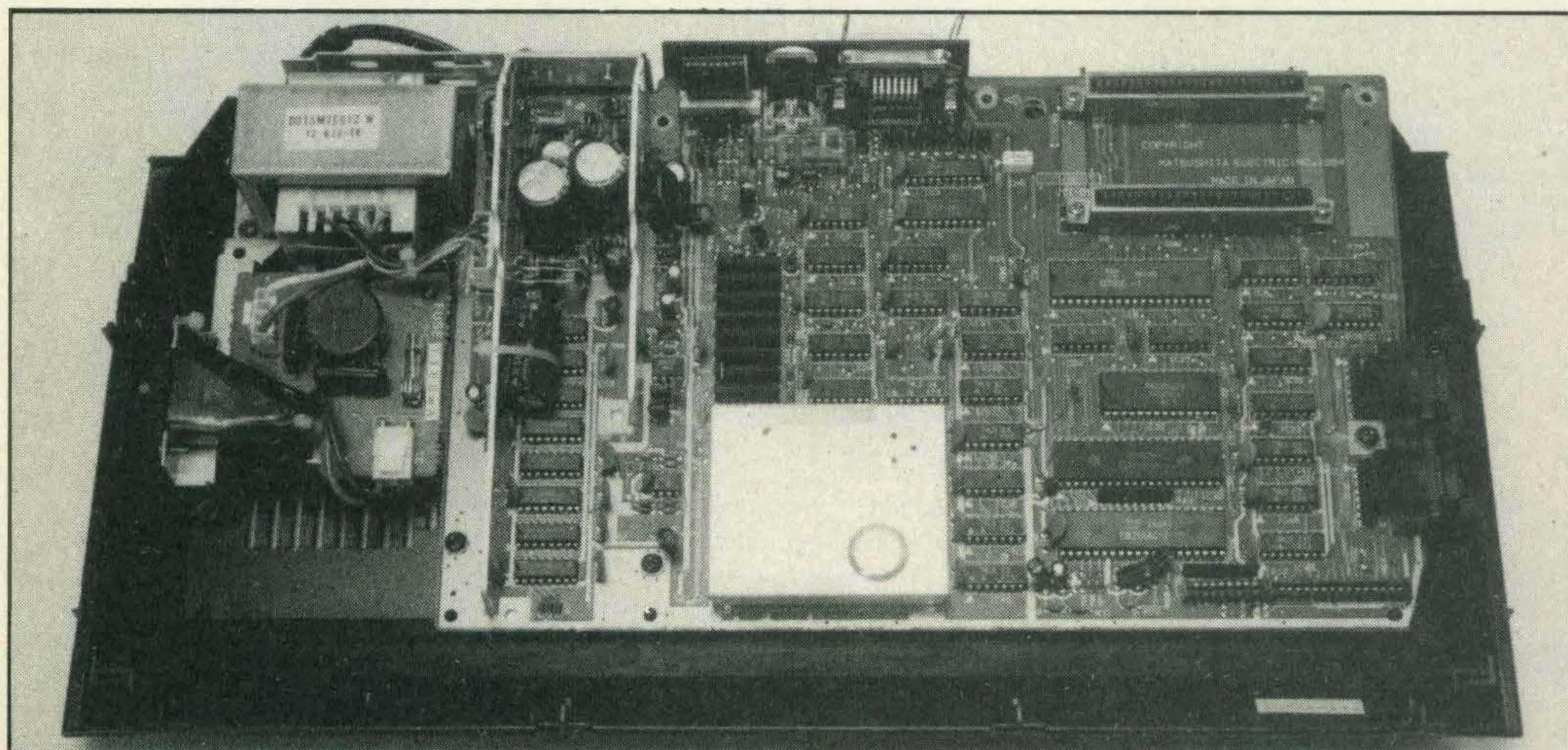
Panasonic aren't as yet producing a wide range of MSX peripherals, either here or in Japan. They have a few monitors and couple of printers for the home market. Over here, all we will be seeing is a joystick and a data recorder. Still, the beauty of MSX is that peripherals from other manufacturers will work quite happily.

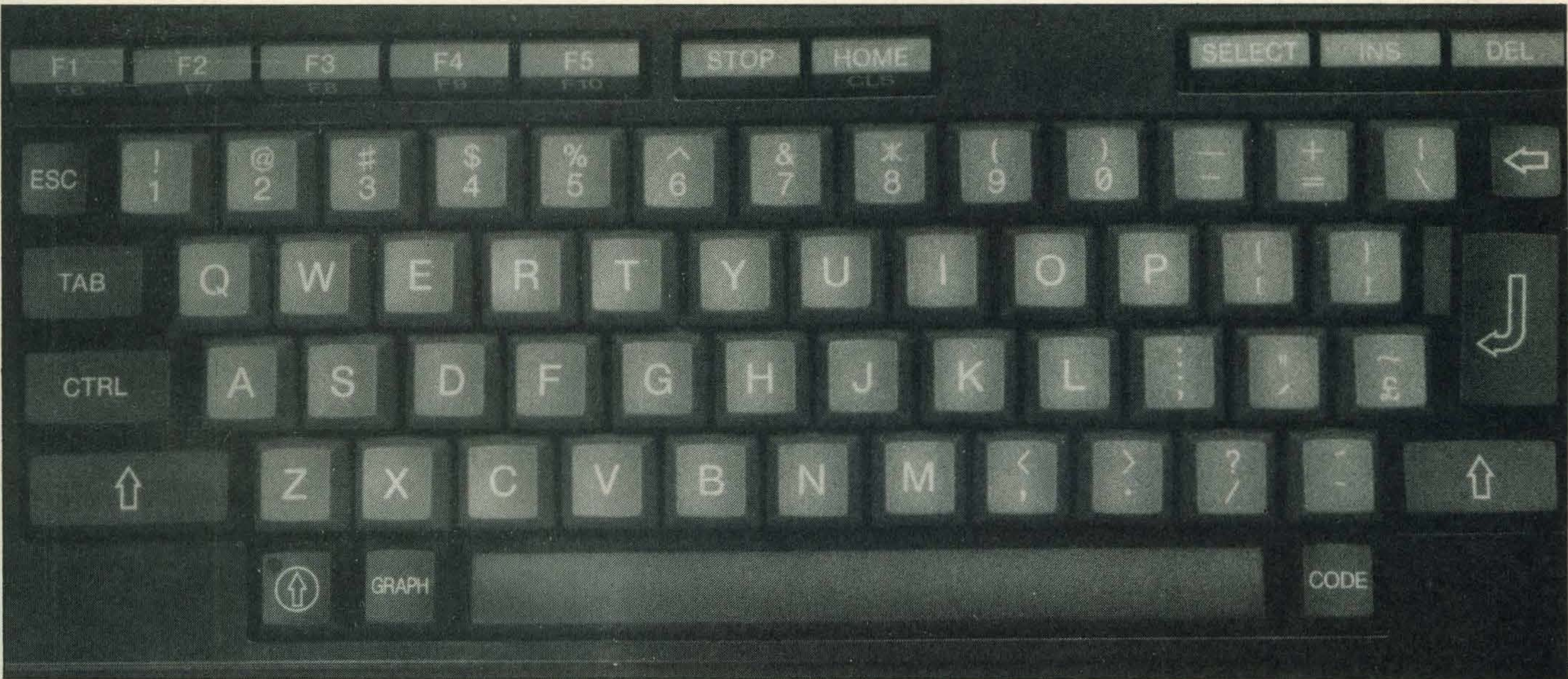
Unlike the other MSX joysticks from Japan that are exactly the same, apart from the colour of the fire button, the National CF2201 joystick is a different model. It is priced at £19.95, slightly more than the other Japanese joysticks, but a much better model despite its plasticky feel. Finished in white with three blue fire buttons, it has a positive action and a long stick that gives plenty of leverage.

The data recorder is model number RQ8100 and an upmarket device with a recommended price of £44.50. It is smaller than other data recorders we have seen, measuring just 200 × 120 × 40mm. The small size is due to there being no on-board transformer. The unit is battery powered only, though you can fit an AC adaptor.

It is a purpose built data recorder with some useful features to make loading and saving programs easier. A tape counter is a fairly common feature. So too is a built-in condensor microphone. Buttons give the usual fast forward/rewind, stop, pause, play and record options. You can review a recording too, fast forwarding or rewinding with the sound coming out of the speaker.

An array of other controls is found down the side of the recorder. There are jacks for a cassette lead, with a remote control socket. Tone and volume is adjusted by ridged wheels. You can also select


Inside, quality assembly is apparent. Note the metal casing around the RF unit and the large internal transformer at top left




Keys are scalloped, solid and conventionally laid out. A few more colours and less arrows might help but you soon get used to it

normal or data functions. The latter plays the tape at full blast, but not through the speaker. You can switch in the speaker to hear a muted sound of the data, to check there is a program to load. The normal use mode would be used for playing back or recording music.

Another switch lets you alter the alignment of the record/ playback head. Sometimes a program that won't load with one head alignment will load with another. It is a facility found on very few low price data recorders.

In use, the Panasonic recorder loaded everything we threw at it. The only problems occurred when the batteries were running out, and an AC adaptor can be well recommended. The

## LIKES

**Excellent styling**

**Quality of assembly**

**Supplied extras**

price is a little high, though it is considerably cheaper than some of the deluxe data recorders we have seen and it is a good looking unit.

Panasonic are also importing a range of 18 cartridges, produced by the ASCII Corporation of Japan. These are priced a little expensively at £18.80, but some of the games are very high quality. Still, you won't need to own a Panasonic computer to try these games.

Performance of the Panasonic is what we might expect

## PANASONIC CF2700 £280
## SPECIFICATION

| | |
|---|---|
| **CPU** | Z-80A equivalent (3.6MHz clock) |
| **MEMORY** | |
| **RAM** | 64K |
| **ROM** | 32K MSX BASIC |
| **VIDEO RAM** | 16K |
| **KEYBOARD** | |
| **TYPE** | Full travel |
| **KEYS** | 48 alphanumeric<br>21 control keys<br>Cursor keypad |
| **NUMERIC KEYPAD** | No |
| **VIDEO DISPLAY** | |
| **TEXT** | 40 characters – 24 lines |
| **GRAPHICS** | Maximum resolution 256 × 192 pixels |
| **COLOURS** | 16 |
| **SPRITES** | 32 |
| **OUTPUT** | TV<br>Monitor |
| **SOUND** | |
| **GENERATOR** | 3 channels with 8 octave range |
| **OUTPUTS** | Mono audio output (6-pin DIN) 150mV/10kOhm standard |
| **INTERFACES** | |
| **JOYSTICKS** | 2 Atari Standard |
| **EXPANSION BUS** | None |
| **CARTRIDGE PORT** | 2 |
| **PRINTER** | 1 × Centronics |
| **SERIAL PORT** | No |
| **CASSETTE** | 8-pin DIN |
| **RESET** | No |
| **DIMENSIONS** | 426 × 249 × 91 (W×D×H) |
| **WEIGHT** | 3.5kg |
| **POWER SUPPLY** | Internal, captive mains lead |
| **FINISH** | Black plastics case, grey and light grey keys with white lettering |
| **SOFTWARE INCLUDED** | None |
| **SUPPLIED ACCESSORIES** | 2 video cable<br>1 audio cable<br>1 cassette interface cable<br>Instruction manual<br>Basic manual |
| **DISTRIBUTOR** | Panasonic (UK) Ltd, 300-318 Bath Rd, Slough, Berks SL1 6JB Tel: (75) 34522 |

of a Japanese MSX micro — excellent. The colours are crisp and bright, sounds well defined. Overheating is not a problem and any shortcomings will be those of your audio or video system.

Panasonic's CF2700 slots into the MSX market towards the top end of the 64K machines. It is rapidly becoming evident that 64K computers are falling into budget and quality categories. The more expensive machines tend to be better made, come from companies with household names and often include worthwhile extras.

The CF2700 is up against such machines as the popular Sony HitBit, the stylish JVC HC-7, the Canon V-20, the Sanyo MCP-100 and the Mitsubishi MLF-80, with a six pack of games. On paper it offers nothing that can't be matched

## DISLIKES

**No reset key**

**Too many arrows**

**A little pricey**

by its rivals and it will probably be available through many of the same outlets. Its looks and feel will play an important part in any sales success.

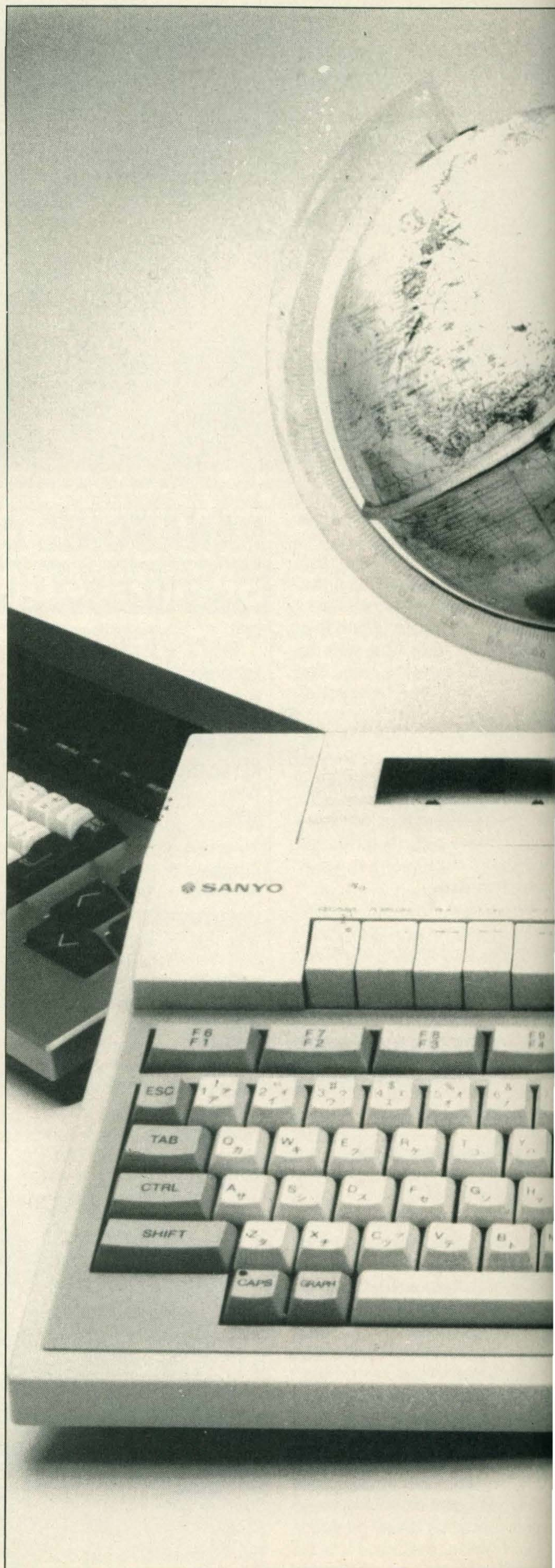
In its favour the Panasonic has a high standard of construction and comes with an excellent choice of cables. It has good documentation, a solid keyboard and all the quality you'd associate with a name like Panasonic.

## Verdict

**Would we recommend it? The answer to that is an unhesitating yes. Having said that, we'd recommend most of the rivals too, as top line MSX computers are undoubtedly excellent computers. Still, the style of the Panasonic does make it stand out from the crowd and for that reason, it should prove a popular machine. If you shop around, you may also find a dealer who is prepared to throw in some free cartridge software too, and if that was the case, have no hesitation in exchanging money for micro.** ■

# TOWARDS A WORLD STANDARD

## Authorities on MSX all agree it is a world-wide standards, but is this really the case? Iain Dawson finds out




**MSX computer makers have been agreed on one point ever since they announced that the arrival of their machines on Britain's shores was imminent. MSX is a standard, they all say. And it's a world-wide standard, they continue — which implies that MSX computers the world over are identical and that they, their peripherals and their software are totally interchangeable.**

But is this the case — is a Japanese MSX computer the same as its UK model, and could a Japanese MSX machine be brought into the UK and used without having to be altered? Now that MSX machines are finding their way into other European countries such as France, Italy and West Germany, are these computers any different from their Japanese and British counterparts and can peripherals from one country be used with a computer from another country?

The answer, in general, is no.

There are differences between MSX machines sold in different countries. These are mainly minor differences, since different countries use different systems to generate television pictures, have different mains voltages and speak different languages. But only a few manufacturers have recognised that someone in the UK might want to use an Italian MSX machine without alteration, for example, and have built machines which will allow this. In general getting a foreign MSX machine to run here in the UK is impossible.

It is almost true to say that software written to run on Japanese MSX machines will run on the MSX machines which are available in the UK. Any graphics produced by the software are distorted and the colours are not the same as those produced by Japanese machines, but the software does run.

So, if Japanese software runs on UK machines, producing a display on a British television set, surely it is possible to connect a British television to a Japanese computer and any software which is run will produce a picture on the television. Unfortunately, this is not the case.

Japan and the UK, and the rest of Europe in fact, use different systems to produce colour pictures on television sets. The UK uses the PAL system. Most of the rest of Western Europe use the PAL system as well — which would be fine but for the fact that the PAL system used on continental Europe is not the same as the PAL used in the UK.

To make matters worse, the French and most of Eastern



**Philips launched the 32K VG8000, its first MSX, in Italy last November, but it won't be available here until later this year. Note the slim shape and membrane-type keyboard**

Europe use a completely different television system called SECAM, while the Japanese use the NTSC system to produce their television pictures. Most television sets in each country are built to accept the decode signals sent using one system, and no other.

Because computers use television pictures to pass information to the outside world they must use whatever system is used in the country where they are sold. So Japanese MSX machines have a video interface which sends NTSC signals, UK machines send PAL signals and any French machine generates SECAM signals. Each country's machines have different circuitry to handle the sending of these signals.

To a piece of software, connecting a machine which uses the PAL system to a television set which has been built to receive signals in the NTSC format is fine. It can sit there happily sending its signals out all day, and, as far as it is concerned, a picture is being produced.

To the user the situation is not fine. Although the computer is successfully sending information to his television set, the set cannot understand what it is receiving, and so cannot produce a television picture.

The upshot of all this is that if you connect a Japanese or an Italian or a West German MSX machine to a British colour television set and expect to see a picture — you'll be disappointed. Mixing and matching television sets and computers from different countries is not on, unless you buy a multi-standard TV.

There is another way around the problem, however. This is to use an RGB monitor rather than a television set to display anything produced by a computer. An RGB signal from any machine will produce an image on any RGB monitor, whatever country the computer and the monitor are from. Unfortunately, only two of the MSX machines available in the UK boast an output for an RGB monitor — the JVC HC-7 and the Sony HB-75.

A second, more easily solved, problem is to do with the different mains voltages used by different countries. The Japanese mains is set at 120 volts, Europe uses 230 volts, the USA and Canada use 150 volts and the UK uses 240 volts.

This means that you cannot connect a foreign MSX peripheral such as a disk drive directly to a British machine — the two pieces of equipment need different voltages to work.

The way around this problem is to put a transformer between the mains outlet and the peripheral, changing the voltage to that needed by the peripheral. The Philips MSX machine, launched in Italy at the end of last year, has been built so that it and its peripherals can be fed by any mains voltage between 100 volts and 600 volts.

Language is a very obvious difference between countries. It is also very obvious that if manufacturers such as Sony or Mitsubishi had brought MSX machines into the UK from Japan and tried to sell them with keyboards embossed with the Japanese alphabet, or which gave error messages in Japanese, they would not have reached their sales targets.

For the Arabic market, a



collaboration between the Arabic firm of Al Alamiah and Microsoft in Japan has led to an Arabic version of MSX, complete with Arabic characters and right to left text entry. It is perhaps the most radical transformation of an MSX computer yet.

Although the differences between French and English are not as huge as those between Japanese and English, they do exist. The French use accents in some of their words, so any machine sold in France must have these accents on its keyboard.

Software, and this includes programming languages and games software, has to give instructions and messages in the language which the people in the country using it can understand. The French especially have a reputation for disliking programming in BASIC because it uses English words, and are unwilling to buy software which does not give operating instructions in French.

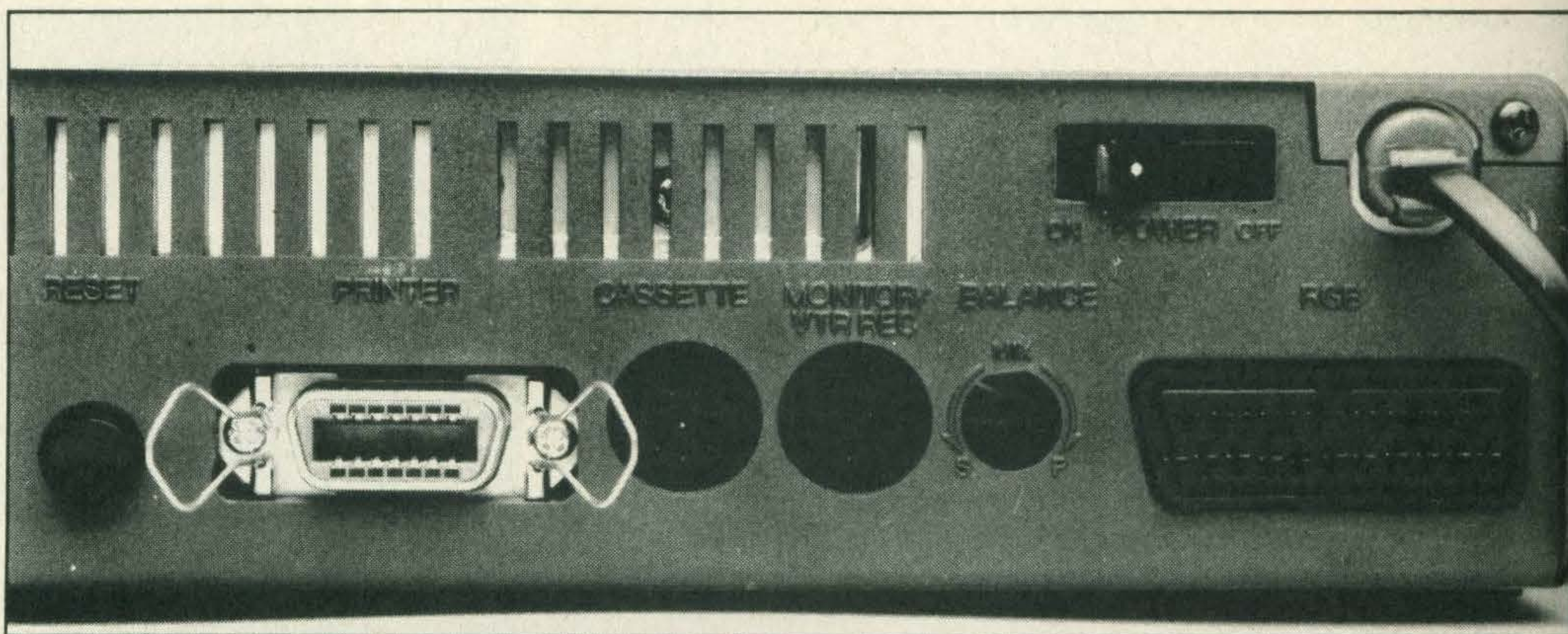
Even British machines sold in the US have to be altered if they are to succeed with the Americans — and vice versa. The changes are minimal, but noticeable — an American would have no use for a British machine which had a pound sign but no dollar sign, for example.

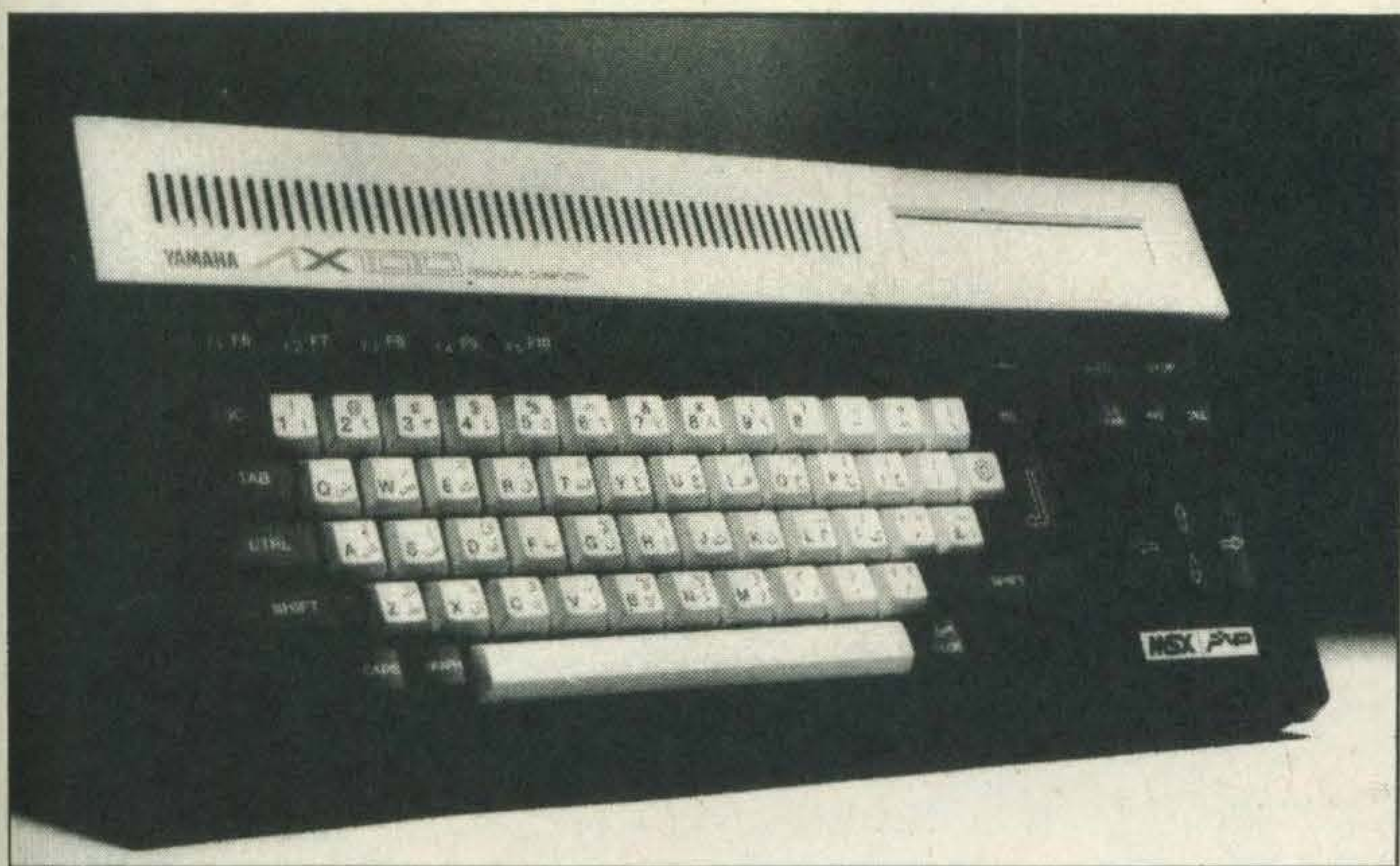
A number of MSX manufacturers have plans to sell their machines in the US, although no-one is offering anything there yet.

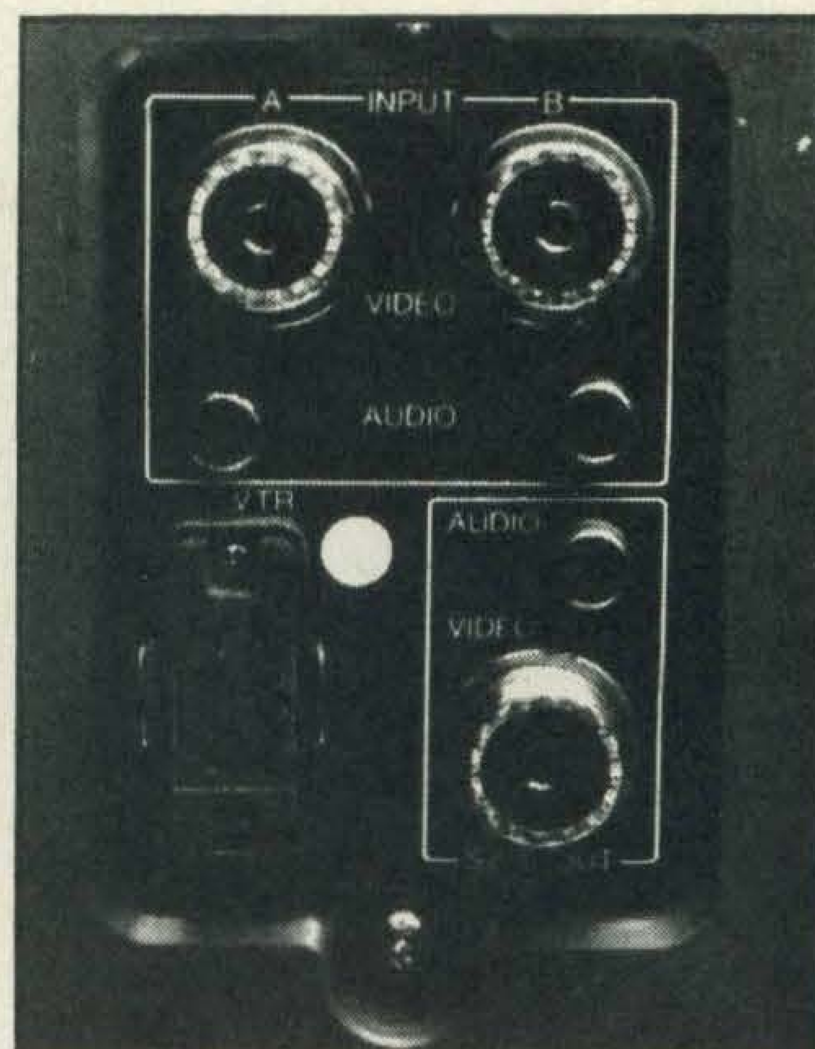
If they are going to sell MSX machines in different countries, the manufacturers will have to alter their products to take a particular country's language, its mains voltage and its television system into account.

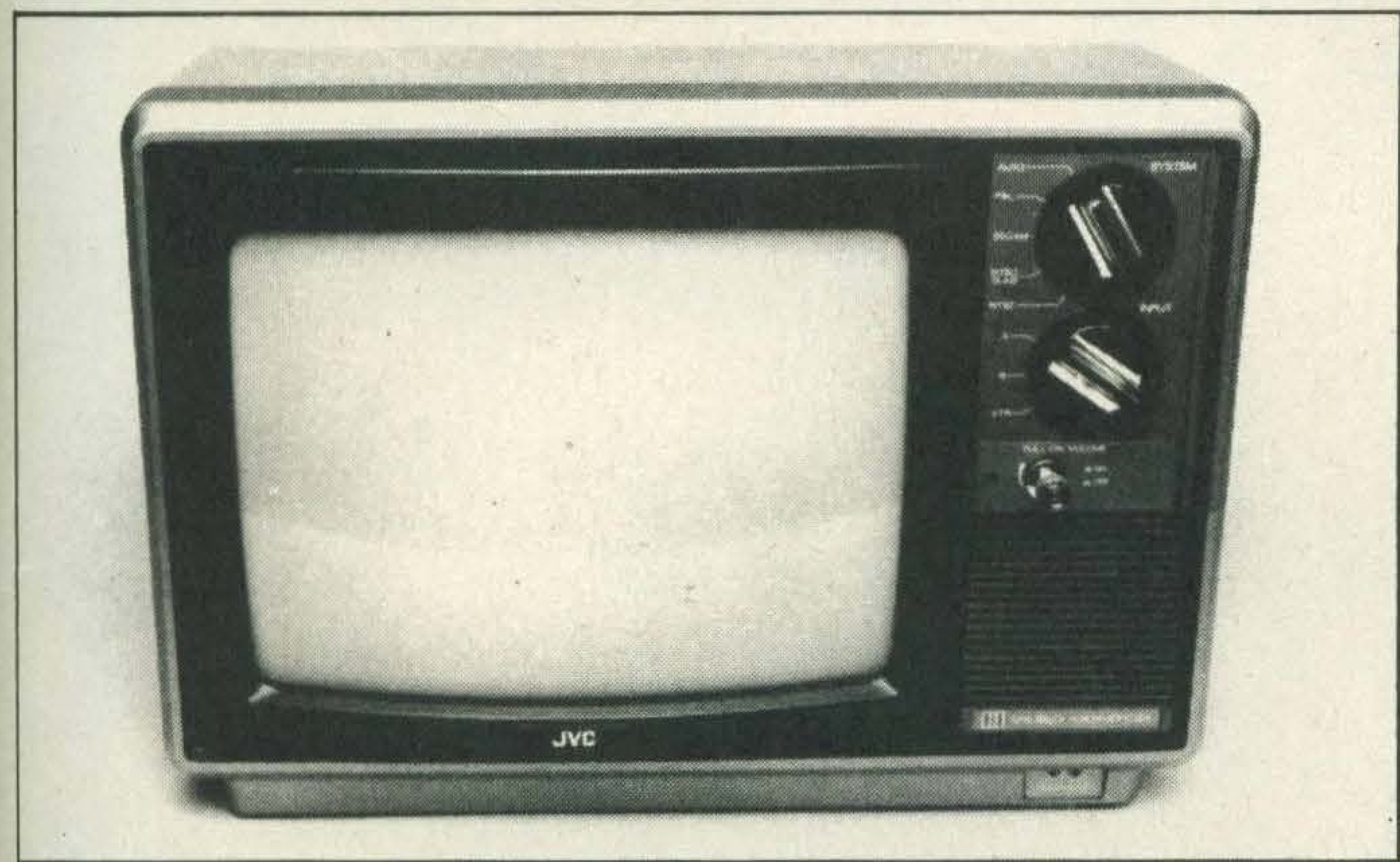
Apart from these unalterables, the vagaries of a country's market can also lead to differences between MSX machines. An example is the different memory sizes of British and Japanese MSX machines.

Most of the machines on sale in Japan have 32K of RAM, or in some cases a miserly 16K of memory. 8K is the minimum amount of memory specified in the MSX standard. In the UK the situation is different — all but two of the machines sold here have 64K of memory. The only machines to sport a smaller






**RGB port, top left, overcomes compatibility problems. Far left: Japanese machines. Centre — Yamaha's Arabic micro. Left: Multi-standard monitor. Above: assorted monitor ports**

RAM are built by Mitsubishi and Yamaha. They have 32K of memory. But Mitsubishi has a 64K machine as well and the Yamaha is more a synthesiser than a computer.

According to the manufacturers the reason for this is that the UK is an advanced market. "The UK market is more advanced than the rest of Europe, and indeed the rest of the world", said a spokesman for Spectravideo, the company which makes the SVI-728. "MSX had to be upgraded above the Japanese level to be acceptable in the UK", continued the spokesman, "and anything with less than 64K would have been seen as inferior and not accepted". This sentiment is echoed by the other MSX companies in the UK — Toshiba, Sanyo, JVC et al.

A counter argument as to why Japanese machines have less memory than their UK versions is that when they were introduced in Japan over a year ago, 16K or 32K was sufficient, and few manufacturers have upgraded their machines — yet.

Such upgrades are imminent though, according to manufacturers, such as Sony and Canon. But you would expect these two companies in particular to voice such an opinion: the only two companies which have given the Japanese versions of their MSX machines 64K of RAM so far are — yes, you guessed it — Sony and Canon.

Of the companies making MSX machines and peripherals, Philips is the odd one out on a number of counts. It is the only European company making an MSX computer. It is the only company not to have sold its machine in Japan. And it is the only company which has not made the UK the first European country to receive its MSX offerings.

Philips, which has its headquarters in Eindhoven, Holland, launched its VG8000 initially in Italy at the end of September.

In December the company announced its machine and peripherals in Austria and Belgium. But Philips' MSX products will not be finding their way into the UK until later this year. Why has Philips decided to do this? What is so different — or bad — about the UK?

"We have some production output", says Gerard Smelt of Philips, Eindhoven, stressing the word 'some'. "We cannot supply the whole European market, so we're starting off small and have chosen to start selling outside the UK in countries like Italy and Germany where demand is comparatively low. The UK is a big market for MSX machines — only the US is bigger."

We British will soak up a lot of the MSX manufacturers' combined output. By comparison West Germany is a small market. Sanyo in Germany reckons that between 25,000 and 50,000 MSX machines will be bought by the Germans in the whole of 1985.

Apart from Philips, there are ten other companies selling MSX computers in the UK, and one or two have launched — or at least shown — products in other European countries. JVC, Toshiba, Spectravideo and Yamaha are interested in the German market along with Philips; Sony, Canon, Hitachi, JVC, Toshiba and Sanyo have shown products in France.

Sony is the most advanced in its plans to conquer Europe. The company announced its HB-75 first in the UK, followed this by launching it in France, Germany, Italy, Spain, Holland, Austria and Denmark in October, 1984. In the following month Sony launched its machine in Scandinavia.

Sony has to ship its machines into Europe from Japan, where they are made. It does not make any computers in the UK at present, but a Sony spokesman says that it may be doing so by this time next year.

Canon has a different position. The company is preparing Europe for its machines using advertising campaigns, but so far the UK is the only European country where its V-20 is sold.

Canon also admits that altering its machine for Europe is posing more problems than it thought it would do. "It's inevitable that MSX will arrive in Europe", says Canon, "but changing the display circuitry etc means it's going to take a bit longer to get there."

Sanyo has launched its machine, the MPC-100, in the UK and has shown it in France. It is possible, says Sanyo, that the French version of its machine will have a built-in data recorder — something which the UK model does not boast.

Germany will be Sanyo's next target after France. The company planned to launch its machine there in March or April this year.

A market not to be forgotten is the good old US of A. The UK is a large market, but the US is even bigger. So far no-one is selling MSX machines there, although a number of companies have plans to do so.

Sony expects to start selling MSX products in the US sometime during this year, with the launch pencilled in for the Comdex computer show in Las Vegas. Philips, too, hopes to launch a machine in the US.

US machines may be more advanced than those seen already in Japan and Europe. The signs are that some may have built-in disk drives or built-in software. These machines will eventually be available in other countries too.

By the end of the year MSX machines will be available around the world. The machines and peripherals sold in any one country will be interchangeable — as was intended when the MSX makers got together in the first place. But MSX machines and peripherals from different countries will not be interchangeable. To get MSX into Europe MSX manufacturers have had to alter their machines to take account of the different television systems, mains voltages and market forces in its member countries.

So do all these differences mean that MSX is not really a standard after all? The answer is that despite the differences, MSX is a standard. After all, how many users will want to mix and match equipment bought from different countries? We suspect very few users indeed will be in that type of situation. ■

# MSX BASIC: THE EVOLUTION OF A STANDARD

**Computer languages have been evolving for many years, with MSX BASIC the latest in a long line of BASICs. Tom Sato traces its development**

**In the early days of computing, there was only one computer language available, FORTRAN. FORTRAN stands for FORmular TRANslation and was developed specifically for scientific usage. It had useful mathematical features such as trigonometric functions and double precision accuracy which were essential for mathematicians and physicists but not very useful for ordinary mortals like you and I.**

However, as the use of computers spread during the Sixties, people with less scientific backgrounds started to use computers as a tool and there was increasing need to develop a computer language which catered for various subjects. This led to development of computer languages such as COBOL, LISP and BASIC.

BASIC stands for Beginner's All purpose Symbolic Instruction Code and was developed by Professors Kemeney and Kurtz of Dartmouth college, USA. Their aim was to create a language which was so easy to learn that children could use computers. It was originally written as an educational tool for computer science students who didn't have a strong mathematical background. Unlike FORTRAN, which was very complex and difficult, BASIC could be learned in matter of a few days.

Dartmouth BASIC, as it was called then, became very popular and many versions were written. It even got the support of the American National Science Foundation. The popularity of Dartmouth BASIC can be attributed to the simplicity of the language. There is less computer jargon within the language to confuse the novice.

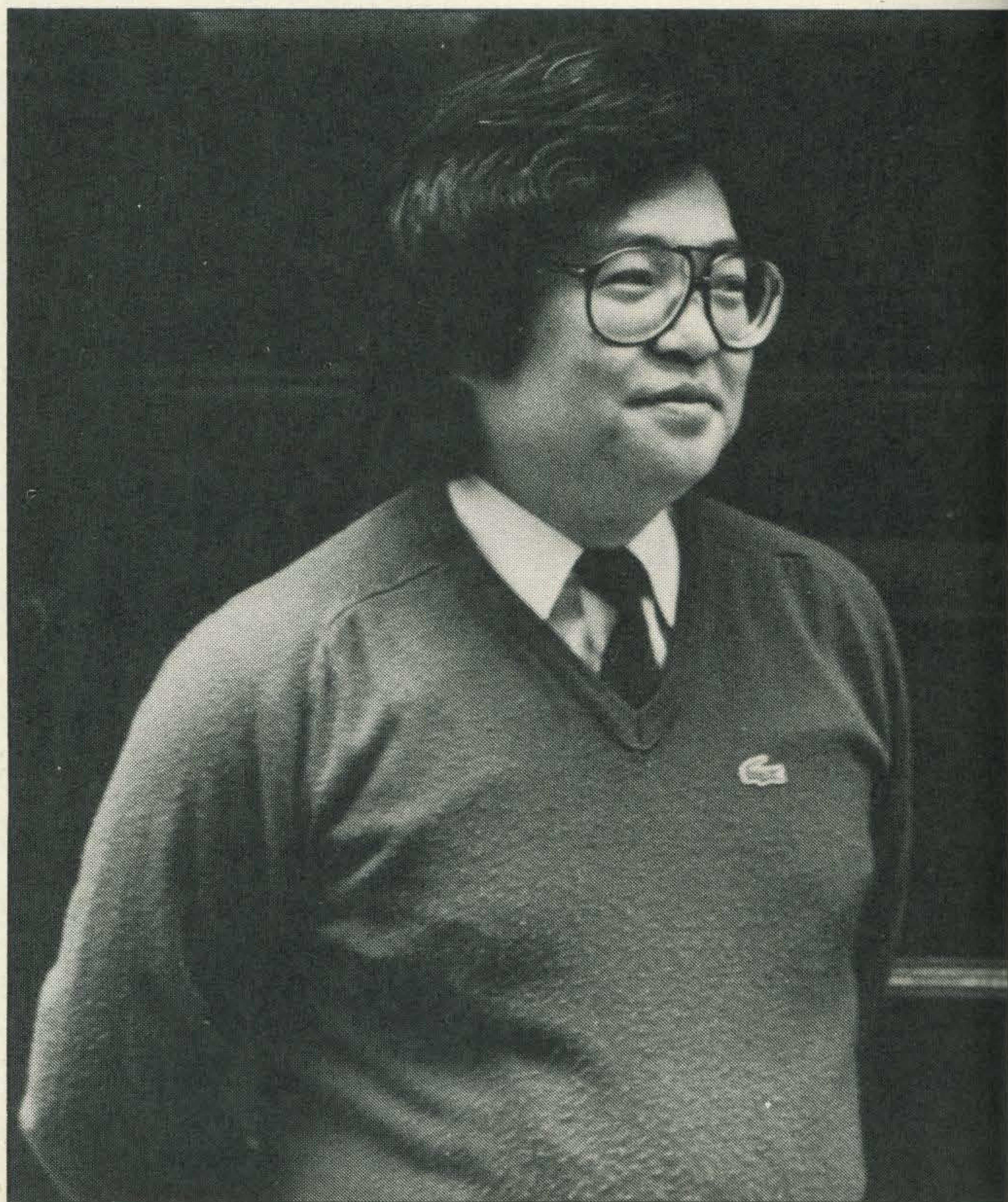
The first Dartmouth BASIC was born on May 1st, 1964. To the creators' delight it ran first time. Those were the days when it was thought impossible to make a personal microcomputer and Dartmouth BASIC was confined to mini and mainframe computers around universities and research institutes. Then, years later, the first microprocessor was invented.

If there is one person who can be said to have contributed the most to the micro computer revolution, it is Bill Gates, founder and president of Microsoft. Bill Gates is undoubtedly the pioneer of the microcomputer. In 1970, when he was just thirteen, he and his friend Paul Allen were regularly using a minicomputer at a company called Computer Centre Corporation.

They were allowed to 'hack' around with computers to find errors in any programs the company was supplied with by the minicomputer manufacturer, Digital Equipment Corporation. As long as Bill Gates and his friend could find bugs in DEC's programs Computer Centre Cor-




**MSX computers have an excellent BASIC, designed by Microsoft. Kay Nishi, below, was the main instigator of MSX**








GW BASIC, for the IBM PC computers, incorporated 14 digit accuracy, and this became a feature of MSX BASIC. MSX DOS was designed by the man who wrote MS DOS for IBM

poration did not have to pay DEC the bills for the computer time the company was using.

At Computer Centre Corporation, Bill Gates learned a lot. In fact he was soon able to infiltrate a large network of computers and was one of the earliest hackers (those people who break into computers which they are not authorised to use).

The film War Games was based around what Gates used to do and the hero, David Lightman is very much like Gates at that time. Gates, like Lightman in the film, was once caught crashing an entire network of computers, called Cybernet.

When in 1974 the first microprocessor, the 8008, was introduced by Intel, Paul Allen proposed to his friend that they should write a BASIC for it. Gates and Allen got hold of one of the very first Intel 8008 microprocessors and they eventually ended up writing a traffic control program for it. The 8008 is a very limited processor and Gates was not sure if they could write a BASIC for it.

The following year, a tiny company called MITS announced the world's first microcomputer, the Altair. The microcomputer age had dawned. The response from the computer and electronics enthusiasts was ecstatic. When Gates and Allen learned of the news via Popular Electronics magazine, they immediately rang MITS boss Ed Roberts and told him that they had a BASIC suitable for Altair.

The Altair was built around Intel's follow-up to the 8008, the 8080 processor. It had 256 bytes (64K MSX computers have 65536 bytes) and no display or keyboard. It had a row of switches and lights and to program it you had to flick the switches to load in machine code. However the Altair had a large number of slots for plug in modules, so it could be expanded.

After calling Ed Roberts, Gates and Allen immediately went to an electronics shop and got themselve a manual for 8080, written by Adam Osborne, who eventually pioneered portable computers, and started working on their BASIC. They knew how to program the 8008 but they had not laid their hands on an 8080 microprocessor and to add to their problems they had told Ed Roberts that they could deliver it in two or three weeks.

As they didn't have an Altair to write the BASIC on, Gates and Allen wrote it on a large computer at Harvard University where Gates was in his first year. It took the two of them six weeks of solid work and when they had finished Paul Allen went to see Ed Roberts.

Ed Roberts was impressed. He had had a lot of programmers promising a BASIC for his Altair but Allen was the first one to come up with the product. Gates and Allen's BASIC was tested on an Altair with seven 1K RAM boards, a paper tape reader and a teletype terminal connected. Allen loaded the program which made the Altair load the BASIC by hand using the switches, then fed in the paper tape containing the BASIC.

The teletype terminal printed Memory Size?

Allen was excited. It had worked first time round. He typed in the amount of memory, which was 7K, then tested it by typing in PRINT 2+2

The teletype replied
4.

It worked! Gates and Allen's BASIC, which was only about 4K long (MSX BASIC is 32K), was to be sold through MITS as the official language for the Altair.

Allen quit his job, Gates left his university and they came down to work for MITS. Soon they formed their own company, Microsoft. New computer companies were springing up by the dozen and Gates and Allen found that they could charge high royalties for their BASIC. They also improved their BASIC and converted it for number of other microprocessors.

Soon the micro revolution swept the world. Tandy introduced TRS 80, Apple, its Apple II and Commodore, the CBM PET.

In 1977, across the Pacific in Japan, one Kazuhiro (Kay) Nishi and his friends had started a small magazine for computer buffs, called ASCII. Nishi, who was still at Waseda University, incorporated a company of the same name and in the following year visited Microsoft at Seattle.

In terms of computer hardware and software, the Japanese were well behind the Americans. Nishi decided to import American software to Japan. His trip in October 1978 resulted in the formation of ASCII Microsoft Ltd, and he gained exclusive rights to sell all Microsoft products in the Far East.

During the pioneering days of the late Seventies, Microsoft produced many other languages for microcomputers, but there was still the need to convert their early 8080 version of MS BASIC for other microprocessors. Better microprocessors, such as Z80 and 6809, had been developed and even 16 bit microprocessors which could process twice as much data as eight bit processors were becoming readily available.





In 1980 Microsoft invested in a DEC mainframe computer. This was to be used as a development tool for writing various versions of the ever popular Microsoft BASIC. Gates and Allen rewrote their BASIC into a neutral language they had devised and wrote a conversion program which would automatically translate the neutral language into machine code for any particular processor.

This meant they wouldn't have to waste so much time on conversion. This also meant that a particular feature of one dialect of MS BASIC could be quite easily added to another even though the processor used was quite different.

Both in Japan and the United States many versions of MS BASIC were sold. A Microsoft BASIC compiler was launched so that the BASIC would have speed comparable to Machine Code, unlike ordinary interpreted MS BASIC. In Britain machines from Oric and Dragon had Microsoft BASIC and the American Commodore VIC and C64 computers also used a dialect of Microsoft BASIC.

In June 1980, Paul Allen was working on a 16 bit version of Microsoft BASIC for Intel's new 8088 and 8086 processors. Both had the capability of handling twice as much information as early 8 bit chips could, although the 8088 was less powerful. This BASIC was to be called GW BASIC.

The following month, Bill Gates had a phone call from the biggest computer company in the world. The company was IBM and they were interested in Microsoft's software.

The following year was spent developing the IBM PC. Microsoft was responsible for all the software including the operating system — that's what you need to control the computer before it can handle BASIC. Microsoft was also able to persuade IBM to create an open system that allowed peripheral devices to be plugged into slots.

The language which Microsoft gave to IBM PC, GW BASIC, was something special, too. Previously, ordinary BASIC could only handle accuracy up to nine digits. That means that the maximum number you can have without losing accuracy is 9,999,999.99. Now if you are running a business and you want to do your accounts with MS BASIC, and if your turnover exceeds ten million, the computer will not give you an accurate figure. To be a viable business computer the IBM PC needed more than nine digit accuracy. Microsoft rewrote all arithmetic routines in their GW BASIC so that it could handle up to 14 digits with total accuracy. 999,999,999,999.99 is a pretty big number and even IBM hasn't the turnover to exceed this.

The disk operating system, MS-DOS, more commonly known as PC DOS, was developed by Tim Paterson of Seattle Computer Products.

The IBM PC was announced in August 1981 and became the most successful and most imitated business computer in the world. Now, though IBM may seem a long way removed from MSX, there is a good reason for bringing them into the picture. The philosophy behind MSX came from the IBM PC work.

Two businessmen were the catalyst for the birth of MSX. In the summer of 1982, two American businessmen, Alex Weiss and Harry Fox, decided to set up a microcomputer company, Spectravideo, after seeing the rapid expansion of Atari and Commodore.

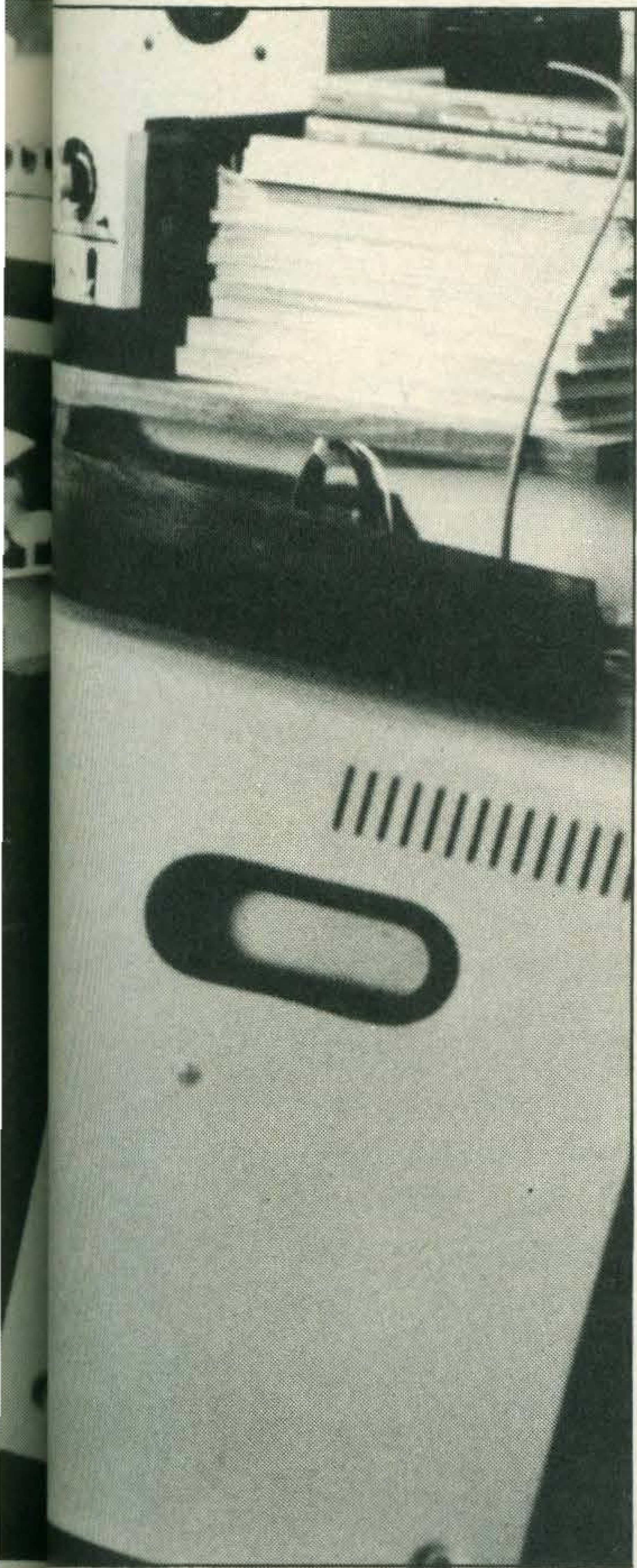




War Games' hero David Lightman was based around Bill Gates' exploits. Spectravideo SV-318 was the micro that spurred MSX. Rik and Sting, right, wrote most of the BASIC, while Bill Gates and Paul Allen, above, founded the Microsoft empire

They were familiar with manufacturing facilities in Hong Kong as they had traded in digital watches before, and they reckoned that they could build a home computer for less than $30, selling it for $100. They had a basic hardware design done in Hong Kong but they needed a BASIC for it. The natural choice was Microsoft.

Although incorporated in New York, Weiss and Fox were based in Hong Kong. From there they tried to contact Microsoft. After two months of business letters, telephones and telexes, they





were told to contact ASCII as they handled all Far Eastern affairs. Finally they got through to the ever omnipresent Kay Nishi, who immediately flew into Hong Kong after seeing their specification for the Spectravideo micro.

Neither Fox or Weiss were computer buffs so in order to liase with ASCII and Microsoft, they hired Steve Ting, known to his friends as Sting. Sting is an unusual character. Previously, he had been to half a dozen universities in the United States, just to see what the computer centres were like. A typical hacker, he knew roughly what kind of BASIC a good microcomputer should have and he did the software specification design for the Spectravideo machine.

So, ASCII Microsoft agreed to do Spectravideo's BASIC. By 1982 ASCII's Tokyo office had the same DEC development computer as Microsoft US and their staff had been fully trained at Seattle. Now, enter two more characters.

The people who did the nitty gritty hard work for creating the Spectravideo's BASIC were two Japanese whizz kids called Rick and Jay. They were the ones who designed the system architecture, Machine Coding and all that mind boggling software which many of us would be glad to keep away from.

So, we have all the actors on stage — Bill, Kay, Sting, Rick and Jay. Together they created the Spectravideo micro which eventually led to MSX.

It happened like this. They decided to bring together all the good bits from the previous work they had done and stick it into a 32K ROM.

Sting demanded that the BASIC should be far better than their earlier effort for eight bit micros because by 1982 there were many machines with a BASIC superior to MS BASIC. The new SVI BASIC or MS BASIC 4.5 was to have full screen editing. They decided to use a lot of so called 'hooks' which made the BASIC interruptable, thus making it easier to expand and capable of handling many tasks at once.

The computer hardware became much more expandable than Spectravideo initially intended, by providing 'slots' as on the IBM PC. To you and I 'slots' are cartridge ports on an MSX into which you can plug in just about anything. They also used the 14 digit accuracy arithmetic routines from GW BASIC.

Sting wanted more. He demanded that BASIC 4.5 should be able to handle long variable names and also have structured statements such as DO LOOPs and WHILE and WEND which all serious computer buffs love. These never made it, simply because Rick and Jay ran out of space in the 32K ROM.

**'Sting demanded that the BASIC should be far better than their earlier effort for eight bit micros'**

Apparently developing the SVI BASIC was not as straightforward as they hoped. Bringing in this routine and that from other BASICs was a fine idea. It meant that you didn't have to write the codes from scratch. In fact some of the codes written by Bill Gates and Paul Allen are still left in the MSX Basic, although I am not sure which routines they are. However, putting in 'hooks' meant that every Machine Code routine had to be modified a bit to make it jump to the 'hooks'. And there are hundreds of little routines in MS BASIC.

What's more, these routines were not written by one programmer. By the time Jay and Rick started on the SVI BASIC, the previous MS BASIC had gone through so many rewrites that many people knew some of the routines but no one person knew all of them. Some of those people had even left Microsoft! What was worse was that these people were mainly based in Seattle and Rick and Jay were in Japan. The result was that Rick had to shuttle from Seattle to Tokyo dozens of times.

By winter 1982/83 the machine was ready. The design was modified so that it could have up to 256K of RAM, plug-in 80 column cards and disk drives. It also meant that the price of the machine rose but the Spectravideo machine could be used as a business machine.

SVI 328 and 728 were released in mid-1983 in the United States but by that time the microcomputer business was in such a chaotic state that Spectravideo didn't do as well as Alex and Harry hoped.

After delivering the SVI computers, Rick and Jay didn't stop work. Kay Nishi had ideas. He had long hoped to set a standard for home computers so that all software and peripherals will be compatible with one another. His friends in the industry agreed. Before MSX there were so many computers incompatible with each other, yet most of them used Microsoft BASIC.

When Kay realised how good the Spectravideo machines were, he just knew that everyone would use it as a standard if it was put to them. So in the winter of 1982/83 Kay went to see about 20 companies saying "I've got this ace system, do you want to go for it?"

The reaction, especially, from Panasonic and Sony was enthusiastic. Both companies had their own micros with MS BASIC and neither were making money. They jumped at the idea and so did more than a dozen other companies, including Spectravideo.

By June 1983 Kay Nishi and Bill Gates announced the MSX standard with 15 manufacturers backing it. But back on ASCII's DEC, Rick and Jay were still 'improving' BASIC 4.5, now, the MSX BASIC, code-named 'cornflake' after BIG K cornflakes. By now, the Spectravideo hardware and software had been modified enough to be regarded as a different system so that the companies involved had to negotiate with Microsoft rather than Spectravideo.

MSX could now be expanded up to one Mega Byte, the number of hooks had been increased and the BASIC better debugged. Rick and Jay didn't stop coding until a few weeks before the actual machine came out. Rick believes some of the early MSX machines may have gone out with an EPROM instead of the proper MSX ROM.

After the MSX BASIC was completed, they had to develop the MSX DOS. Kay got Tim Patterson who did the MS DOS for IBM PC to do this. Rick and Jay didn't stop when the MSX project finished. By August 1983 they were working on MSX 2 which will be compatible with MSX 1.

And that's the history of MSX BASIC, so far. ■

# JOYSTICK DUEL

**We've assembled twenty top joysticks for this giant group test. Debbie Goldfinch has been trying them out**

**A joystick is a games controller that plugs into your micro to give you easier and faster control over your games playing than that offered by the keyboard. Joysticks come in many different styles; some don't have a 'stick' as such, they may have a touch-sensitive pad, buttons or a rotating ball. They can make a big difference to your games performance — just as the right equipment for any activity can improve your performance, and add to your enjoyment.**

Many have rubber suction cups to grip the table top, some have rubber feet to give them some purchase and others are designed solely to be held in the hand. Models often have two fire buttons, one being for rapid fire which is useful for fast games. Most joysticks give you eight directions of movement. Lead lengths vary, so if you like to move around while you play, look for a longer lead. Prices vary greatly too, but you don't need to spend a fortune to get a good performer.

If you are a keen games player, you will want the joystick that is the most suitable to help you notch up that high score, and that does not fall to pieces when you are in the middle of saving the planet from imminent destruction by the Thargoids.

So what should you look for when choosing a joystick? Firstly, decide how much you want to spend and check for compatibility with your computer. Then make sure that it's comfortable to hold and that you can easily reach the fire button. Check that it's stable and won't skid about, and that the handle doesn't feel too 'sloppy' or too stiff when you move it.

Does the joystick feel sturdy? It will have to withstand a lot of rough treatment, so ensure that the model you like comes with a decent guarantee. Finally, no matter if it looks like you should be saying 'Beam me up, Scotty' into it or using it to pilot the Space Shuttle, if you like the design and it meets the other standards — get it!

In our test, we feature twenty models of joystick and have examined them in order of price, starting with the least expensive. We used three different games to try out the sticks performance — Hyper Olympics, a two-way type game where you must move left, right and jump (fire); Sparkie, a four-way maze game and Super Cobra, where you are the pilot of a helicopter flying over a landscape avoiding or shooting missiles, dropping bombs and picking up booty — an eight-way style game.

The specification chart lists all the joysticks in alphabetical order and gives you all the relevant details — price, and number of fire buttons for example, at a glance.

All the joysticks had been well used in the office before the test began, so we had a fair idea of how well they would survive the wear and tear they might be subjected to in home use. Our verdict is at the end of the reports.



# ON TRIAL

**Junior Pro** **£5.99**
This joystick is small enough to fit comfortably into one hand and has four rubber feet that help stop it from sliding on a table top. It is very good for 8-way, positive and quick with little movement needed to get good response from it.
The joystick does give good



control and fast response for 2, 4 and 8-way games and it has a good sized 'rounded crescent' shaped fire button. It is good looking, simple, lightweight, easy to hold and a good performer. Junior Pro is only marred by the poor design of the knob on the stick's end.

**Joy Card** **£7.45**
The Joy Card is a games controller of small, 'credit card' design. If you have large hands, it can be a tricky model to operate. The two fire buttons are placed rather close together, but it feels strong and has no moving parts to wear out.
For 8-way Super Cobra, it was not too good on rapid change of direction and seemed rather jerky. For 2-way, it was practically impossible to even qualify with the Joy Card, and for 4-way Sparkie, it was difficult to change



direction. With a lot of practise, it could be a reasonable performer — but I don't hear any cries of 'Don't leave home without one'!

**Lightning Deluxe** **£7.50**
The Lightning is a lightweight, black and red joystick. It has four sucker feet that grip quite firmly and two reasonably sized fire buttons, one on the top of the stick, the other on the base. For 8-way Super Cobra, it responded well but felt like it was going to fall apart at any minute. It seemed to have a mind of its own and was not good for fine movements.



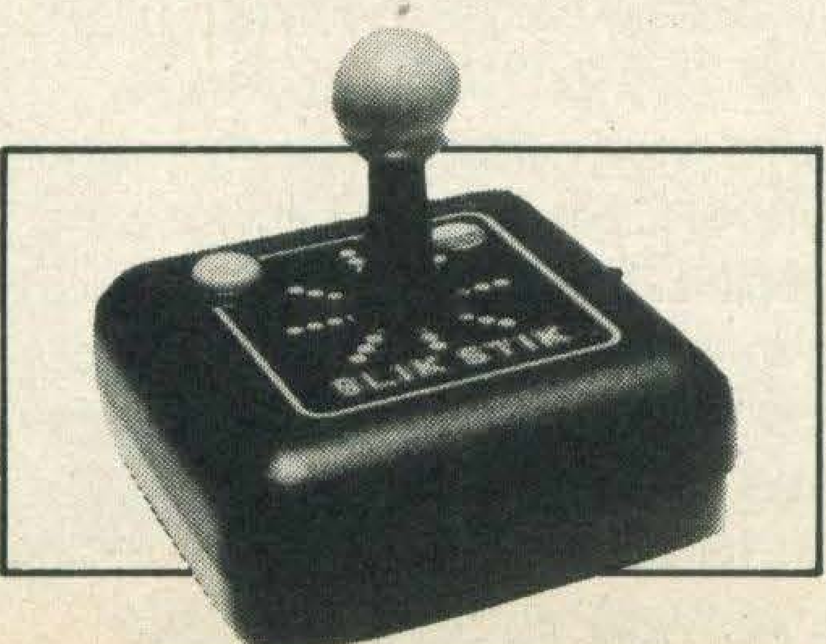
It worked quite well for 2-way, requiring only small movement of the stick for response. For 4-way, the fire button was fast and movement was precise. One complaint with this one was that the handle, although comfortable, would be better if it was slimmer. Otherwise, it's a good value joystick.

**Atari CX-40** **£7.99**
Very simple in design, this joystick is slow and uncomfortable and needs a lot of effort to get movement from it for 4-way



games. The single fire button is poor in response and for 2-way, it is again slow. It performs little better for 8-way, it's still very stiff, a bit jerky on diagonals and not at all comfortable. It has four effective non-slip feet, but not much else to recommend it.

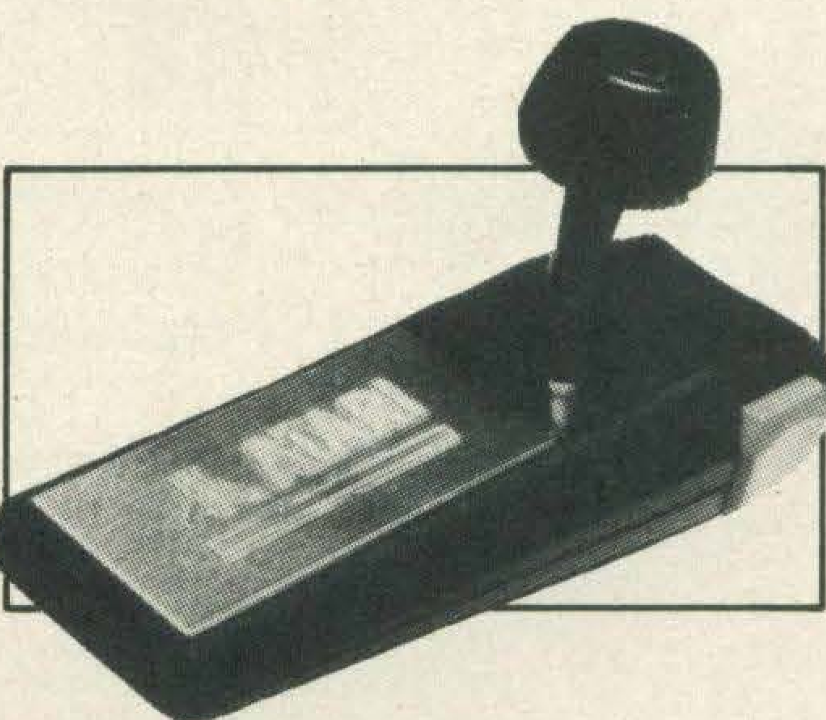
**Slik Stik** **£8.95**
This is a nice looking, smallish joystick, neat and simple in design and robustly built. It fits comfortably into the hand and the short stick has a marble-sized round knob at the end of it. The fire button is quite well placed to the top left of the stick. For 4-way games, the stick didn't give positive movement and was slow to respond although the fire button worked well.
It was better for 2-way, with little effort needed to get a fast speed, and little discomfort. It




didn't operate well with the 8-way; the fire button seemed slow and the stick too small to easily handle the eight directions of movement. It was not easy to control and gave a rather erratic performance.

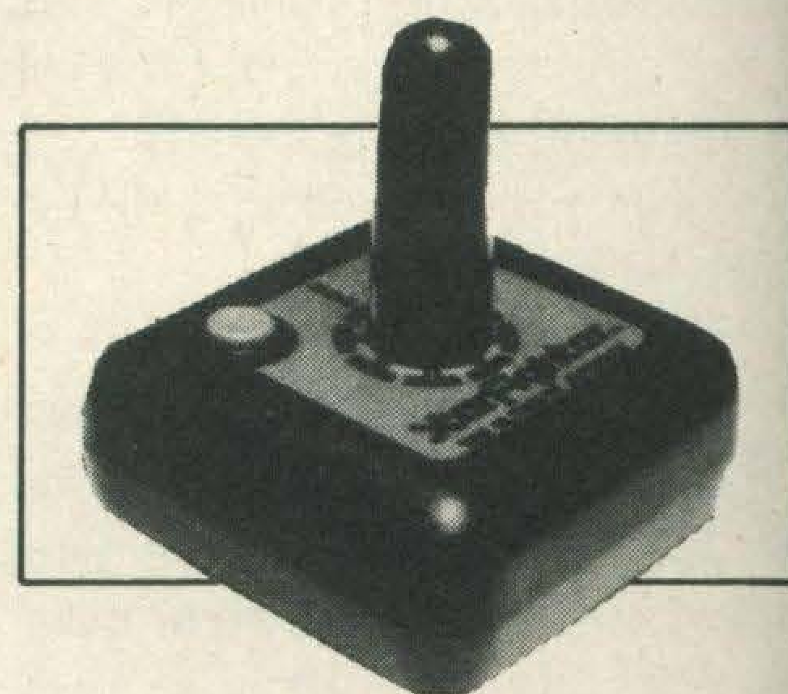



**Delta 3SM** **£9.95**
This hand held joystick wasn't a good overall performer. For 8-way games, it was slow to react and degree of movement needed to pilot the helicopter in the game was too great. In Hyper Olympics, you have to put in a lot of work because the stick is so small.
It was a little better for 4-way games, giving reasonable control and fast fire, with a choice of three buttons, but once again these could have been bigger. It is not bad looking, light-weight, and the casing seems robust but the stick feels very flimsy. It is not really star quality.



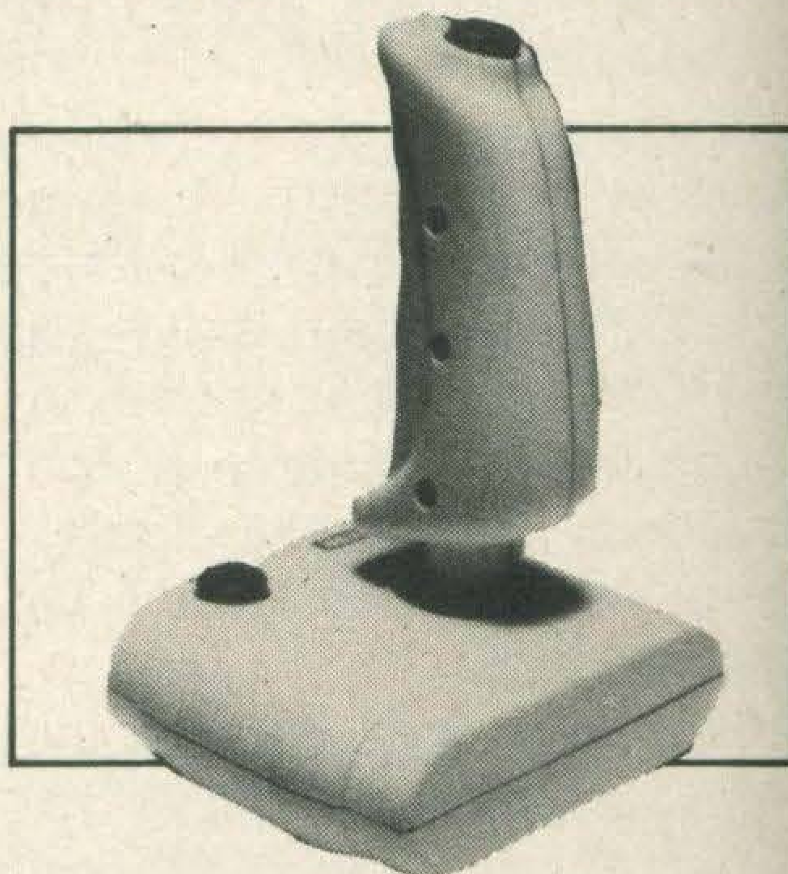

**Atari CX-24** **£9.99**
This Atari is an unusual looking joystick with two large orange fire buttons sited on the side of the casing, and a stick centred just below these. Both casing and stick are well made and look like they are built to last. The stick moves well, and you don't need to move it too far to get good response for 8 and 4-way, and a fast speed for 2-way.
It is comfortable to hold and the stick has a good-sized knob with raised moulding for extra grip. The fire buttons are a bit confusing until you get used to them, but are a good size and well positioned. This lightweight model is a pleasure to use and turns in a good performance every time.

**StarFighter** **£10.95**
Billed by Suncom as 'the ultimate joystick', this accolade seems a little too enthusiastic. It wasn't a great joystick for 8-way, it was passable for up, down, right, left but was sluggish in response and uncomfortable to use. It was hopeless for Hyper Olympics— it seems unlikely that it could even manage an 'egg and spoon' race at a local school sportsday!



The stick is too short to be gripped easily and the base has no grip on a table top. The fire button was sluggish for the 4-way game and the joystick generally slow to respond. The only thing in its favour is that it does seem strongly made and the price is reasonable.

**Quickshot SV1-101** **£11.95**
The Quickshot 1 has four stable sucker feet and a raised moulded section on the left hand side of the base incorporating a fire button. The moulded handle, which has another fire button on the top, is far too fat to be comfortable to hold. For 8-way games you have to move the handle a lot to get anything out of it, and it felt a little sloppy.
The fire buttons were only average in response. It didn't break any world records in Hyper Olympics and it gave an



average to slow performance for 4-way games. On the whole, it was disappointing because it was quite nicely designed and seemed well made but it's performance fell short of the mark.



**Gunshot 1** **£11.95**

The Gunshot has a fat, uncomfortable handle which feels very flimsy but which was, in fact, excellent in response for 8-way games. The two fire buttons were both easily accessible and positive. For the 2-way game, the fat handle feels rather loose and it took a lot of effort to get any speed out of the joystick.

For 4-way, it was once again a good performer, responding well and with a snappy fire button. It has four sucker feet which hold the table top firmly. The Gunshot is not the most attractive looking joystick around; it's rather bulky and finished in cream and a drab pale khaki colour, and the handle is too fat — but it certainly redeems itself in operation.



**Competition Pro 3000 £12.75**

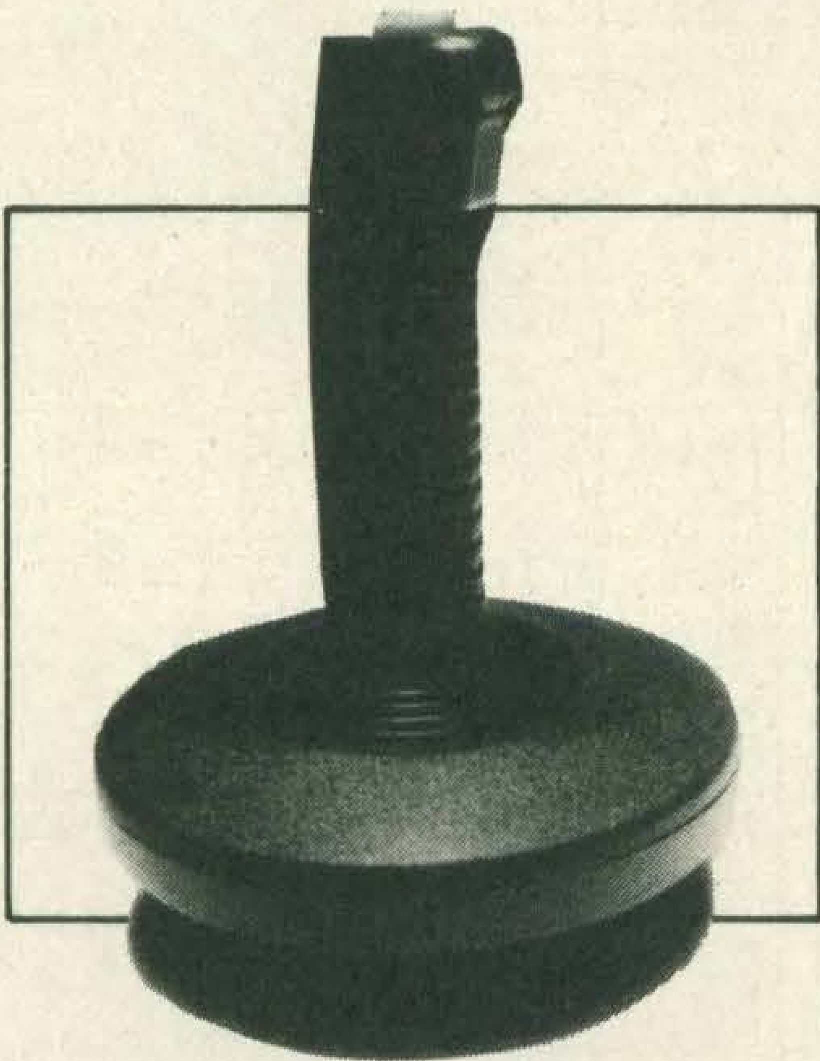
This joystick is comfortable to use but has a rather light and insubstantial feel to it. It's quite nice in design and has three fire buttons, two on the handle and one large pad on the base. For 8-way, the fire button was good and well positioned, but the stick was difficult to move and poor on diagonal movement.

For 2-way, the stick didn't offer good control and was slow. It was less than good for 4-way, being sluggish and unresponsive with a slow fire button. Not a very good joystick if you're aiming for record breaking scores.

**SuperChamp** **£12.95**

An unusual joystick, this; it looks like a flying saucer with a handle. The flex can be wound in to the base. The four sucker feet really do grip the table top firmly and it stays put during even the most enthusiastic use. For Hyper Olympics it is possible to get a very fast speed with this model, but you expend a lot of energy doing it.

For 8-way it wasn't bad, but once again you have to thrash it to get a response. The whole centre section moves which gives the unfortunate feeling



that the joystick is about to fall apart at any minute!

The fire buttons on the top and front of the handle are good because you only need to concentrate on moving. Not a bad performer, but it is rather bulky to handle.

**Competition Pro 5000 £13.50**

The Competition Pro doesn't have suckers, just rubber feet and it is not easy to get a proper grip on it without putting your hand over one of the fire buttons. It does have a large round ball at the end of the stick which is particularly comfortable to use and the two big fire buttons are easy to hit. It's good for 8-way Super Cobra, although the response could



be a bit crisper. For the 2-way game, the stick movement was a bit sloppy.

Apart from this, it was easy to use and gave a fast speed, but it was rather jerky on 4-way. It seems quite a sturdy joystick, but not particularly inspiring in design.



**Canon VJ200** **£15**

This is Canon's version of the MSX joystick. Several of the other MSX manufacturers including JVC and Mitsubishi have produced similar models with different coloured fire buttons.

A large orange fire button covers almost the whole of the top of the stick and it has a supplementary fire button on the base. Both are well placed and for 4 and 8-way games were good in response.

The stick is joined to the base by a sort of ball and socket joint and feels very sloppy. Despite this, it was effective and responded well in the 8-way Super Cobra game and equally well in 4-way Sparkie. It feels rather flimsy, but it is comfortable to use and gives a good account of itself in games.



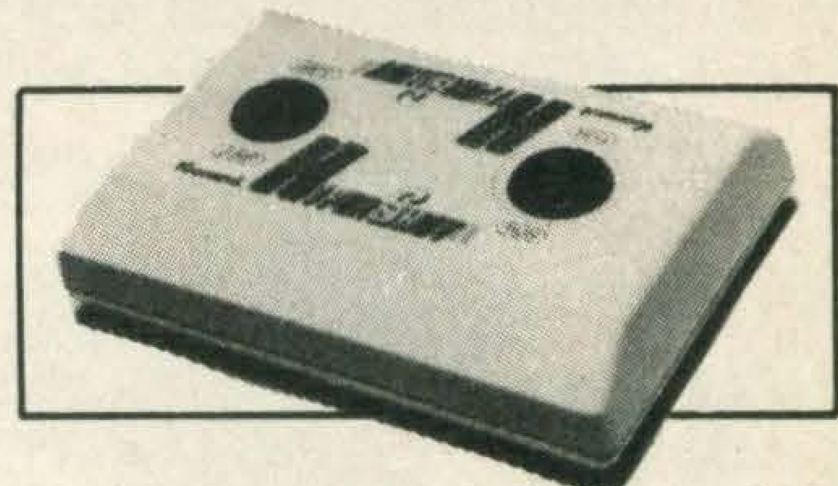
**Tac-2** **£15.95**

The Tac-2 is a bit like the Slik Stik's big brother in design, and once again looks good and seems very strongly made. It has two large fire buttons either side of the stick, and the stick itself has a large round black ball on the end that fits comfortably into the palm of the hand. For 2-way, it only required a little movement to get a respectable speed out of it, and it was good to use. For 8-way, it didn't perform so well and seemed to make movement rather jerky.

However, it was comfortable to use, if somewhat sluggish, which was disappointing. If you have large hands, another problem which arises is that the short length of stick makes it difficult to get a good grip. It seems to be quite competent for 4-way, but not that easy to use.

**HyperShot** **£15.99**

Hyper Shot is designed especially for Track and Field style games. It is a large, white box-shaped device, quite stylish, with two large red buttons,

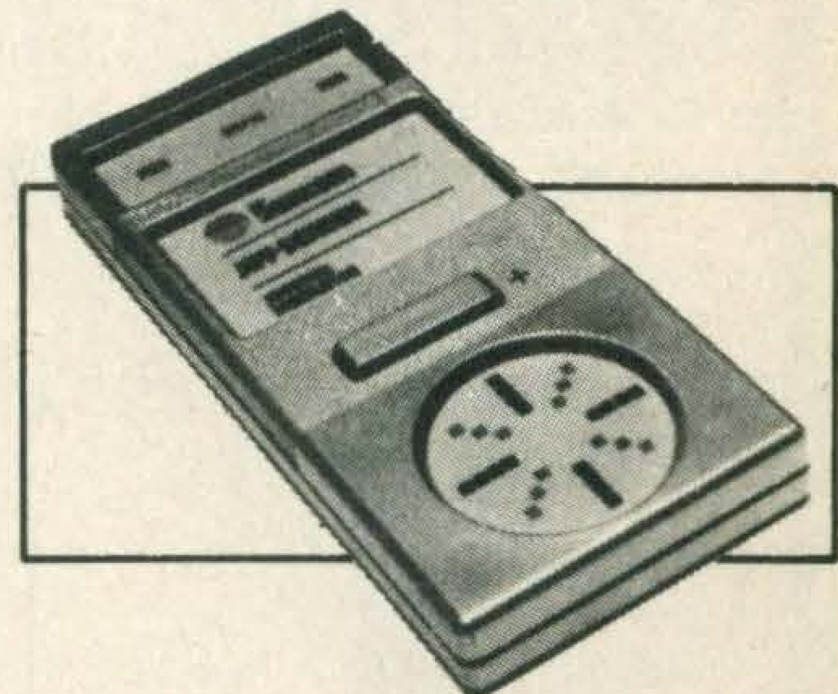


one for jump and one for run. Its four rubber feet are rather small, but by design you hold it quite steady with both hands anyway. For 2-way games it is not bad, but rather limited. However, it doesn't require much effort to get a fast speed with it. It is well made and, with no moving handle, will probably last well. The Hyper Shot is not designed for 4 or 8-way games.

**JoySensor** **£19.95**

The Joy Sensor really does look like the sort of thing that Captain Kirk might use to communicate with the SS Enterprise. It is a lightweight silver games controller, and is touch sensitive. It is not easy to use unless you have had a lot of practice, but once mastered it is exceptionally quick to respond.

It's quite good for 8-way games and although the fire



panel could be a bit closer to the direction control, you can just keep your finger on to fire continuously. There is a choice of fire and rapid fire available. I actually got a blistered finger when using the Joy Sensor to play Hyper Olympics, but did clock up some very fast



speeds. It is good for 8-way games because of its fast response but you do tend to zoom off in the wrong direction unless you concentrate.

**Sony JS-55 £19.95**

If you've always wanted to be a racing driver, this is the joystick for you. Unfortunately, it's performance doesn't quite match its looks. The base feels solid and looks hardwearing but the movement feels very flimsy. There is an option of three fire buttons; two small ones on either side of the stick top and a large pad on the



base.

For 8-way, movement was imprecise and sloppy although the fire buttons responded well and for 2-way it was sluggish. For the 4-way Sparkie, it's performance was much better — good and fast with the fire buttons on the handle. On the whole, the JS-55 is a very nice piece of equipment, comfortable to use, sturdily built and good-looking — but it's not quite Grand Prix Formula One.

**Computer Command £27.95**

The Computer Command is a very sturdy feeling joystick and is Wico's only MSX-compatible joystick. They do have a good range of joysticks (listed in the buyers guide), but until the interface at £4.99 is available they won't operate fully with



MSX. It is quite good looking, with a cream and brown base and a large red handle. It has four rubber feet on the base which stopped it sliding about

| Model | Number of Fire Buttons | Moving Direction | Fast Fire | Feet | Length of Cord | Price | 2-Way | 4-Way | 8-Way | Supplier |
|---|---|---|---|---|---|---|---|---|---|---|
| Atari CX-40 | 1 | 8 way | No | Rubber feet | 120cm | £7.99 | ★★ | ★ | ★ | Atari International (0753) 33344 |
| Atari CX-24 | 2 | 8 way | No | none | 150cm | £9.99 | ★★★★ | ★★★ | ★★★ | Atari International |
| Canon VJ200 | 2 | 8 way | No | Suction cups | 120cm | £15.00 | ★★★ | ★★★★ | ★★★★ | Canon (UK) Ltd 01-773 3173 |
| Competition Pro 3000 | 3 | 8 way | No | Rubber feet | 150cm | £12.75 | ★★ | ★★ | ★★★ | Kempston Micro Electronics (0234) 856633 |
| Competition Pro 5000 | 2 | 8 way | No | Rubber feet | 150cm | £13.50 | ★★ | ★★★ | ★★★ | Kempston Micro Electronics |
| Computer Command | 2 | 8 way | Yes | Rubber feet | 150cm | £27.95 | ★★ | ★★★ | ★★★★ | Computer Games Ltd 01-508 5600 |
| Delta 3SM | 3 | Infinite | Yes | Rubber feet | 130cm | £9.95 | ★ | ★★ | ★ | Voltmace (0462) 894410 |
| Gunshot 1 | 2 | 8 way | No | Suction cups | 135cm | £11.95 | ★★ | ★★★★ | ★★★★★ | Vulcan Electronics 01-203 6366 |
| Hypershot | 2 | n/a | No | Rubber feet | 110cm | £15.99 | ★★★ | n/a | n/a | Konami Ltd 01-429 2446 |
| Joycard | 2 | 8 way | No | Hand held | 120cm | £7.45 | ★ | ★★ | ★★ | Hudsonsoft (UK) Ltd 01-4583310 |
| Joy Sensor | Touch Sensitive Pad | Infinite | Yes | Hand held | 150cm | £19.95 | ★★ | ★★★ | ★★ | Consumer Electronics (061) 682 2339 |
| Junior Pro | 1 | 8 way | No | Rubber feet | 150cm | £5.99 | ★★★ | ★★★ | ★★★ | Kempston Micro Electronics |
| Lightning Deluxe | 2 | 8 way | No | Suction cups | 120cm | £7.50 | ★★★ | ★★★★ | ★★★ | Lightning 01-969 5255 |
| Quickshot 1 | 2 | 8 way | No | Suction cups | 120cm | £11.95 | ★★ | ★★ | ★ | Spectravideo 01-330 0101 |
| Slik Stik | 1 | 8 way | No | Plastic ridges | 150cm | £8.95 | ★★★★ | ★★ | ★ | Consumer Electronics |
| Sony JS-55 | 3 | 8 way | No | Rubber feet | 115cm | £19.95 | ★★ | ★★★ | ★★★ | Sony (UK) Ltd (81) 61688 |
| Sony JS-75 | 3 | 8 way | No | Hand held | n/a | £64.95 | ★★★ | ★★ | ★★★ | Sony (UK) Ltd |
| Starfighter | 1 | 8 way | No | Plastic ridges | 150cm | £10.95 | ★★ | ★★ | ★★ | Consumer Electronics |
| Super Champ | 2 | 12 way | No | Suction cups | 300cm | £12.95 | ★★★ | ★★ | ★★★ | Dean Electronics (0344) 885661 |
| Tac-2 | 2 | 8 way | No | Plastic ridges | 180cm | £15.95 | ★★★★ | ★★★ | ★★ | Consumer Electronics |

**Scoring for games** ★ **poor** ★★ **average** ★★★ **good** ★★★★ **very good** ★★★★★ **excellent**

reasonably well. The comfortable handle is contoured to fit the hand. A fire button on top of the handle is easy to reach with your thumb and there is also a good sized fire button on the base.

The handle allows 8-way movement and is not sloppy — if anything it's a bit too firm. It is not good for the 2-way Hyper Olympics where the faster you waggle the handle, the faster you go, but for the 4-way it was good with the well sited fire button. For the 8-way it was very good, positive in movement and quick to respond.

**Sony JS-75 £64.95**

This is a remote control joystick controller, and looks very stylish. It comes complete with interface that plugs into your computer and has no lead — you just point it at the screen and away you go. However, you still have to select your game option from the keyboard so you are still tied to the micro, which seems to make remote control rather pointless. The controller has three fire buttons, two small blue ones on the side and a large pad on top. They respond well and are easily accessible.

The short handle is uncomfortable and difficult to hold. For 2-way games, the con-




troller gives fast speeds, but takes quite a lot of effort to operate. For 8-way, control is quite good but not as good as that of conventional joysticks. The JS-75 feels sturdy and gives an adequate performance for 4-way but is exceptionally uncomfortable to use. It is obviously well made, but does seem rather gimmicky and is not really worth the comparatively expensive price. It's not the controller to go for if you want to notch up megascores.

# Verdict

**Buying a joystick is very much a matter of personal preference, and it's clear from the test that although you do tend to get very much what you pay for — a reasonably priced model, such as the Atari CX-40 at £7.99 often gives a very creditable performance, whereas the latest super-gadget can be a real let down.**

**The main criterion seems to be to set yourself a top price, and then go and try those models within that range. Don't choose the cheapest — it may not be cheap in the long run if it wears out quickly, breaks or you find it inadequate and have to buy a better one — get the best that *you* can afford, and most important, get one that feels comfortable and performs well for you.** ■

# BLACKBOARD BASIC

**Learning to use your computer can seem a daunting task. We've been finding out how to get computer education**

**There is more to life and computers than zapping myriads of mutated Martians. If you've been presented with an MSX at Christmas or are counting your pennies with the intention of investing in one, the only way you can justify the costs is to learn how to use it properly**

Playing games for hours and days on end can get very boring indeed. To squeeze the absolute maximum out of your MSX, you are going to have to learn what its potential really is.

Those of you still at school will probably have already learned something about computers, but if you left school well before the home computer revolution really started you will probably feel rather frightened by them.

It's important to remember that anyone can program a computer — even your five year old daughter is probably learning to break into the national defence system with a modem. But it needs commitment and does take time, practice and a lot of patience.

A computer will do anything you tell it to. It cannot think for itself and so if you make a catastrophic error like telling it to erase a week's worth of programs instead of telling it to save them, that is exactly what it will do. Poof, a week's work gone. It would have been obvious to anyone but the computer that you'd meant save.

Factors to consider in your search for computer knowledge are whether you prefer to work on your own, the amount of spare time you have, whether you entertain thoughts of actually gaining a recognised computer qualification and of course your geographical location. If you live in London, the opportunities for courses on computers are probably greater than in the heights of the Scottish Highlands.

As the MSX machines have only been on sale to the British public for the last few months, the availability of MSX specific books and courses are few and far between. We have had to concentrate on the generalised computer courses and books, working on the principle that once you've grasped the basics of a computer and its capabilities you can easily adapt the ideas to the MSX.

Options include evening or day classes, courses of further education, short introductory courses, teaching yourself with the aid of books or even videos. Whichever option you choose will depend on the time, money and effort you are prepared to devote to the pursuit of computer literacy.

If your time is valuable, evening or day classes may be one of the most convenient ways of teaching yourself something about computers. The local education authority will give you advice on what courses have been arranged and these are usually held in adult education establishments. We investigated the courses held in South West London by the Richmond Adult College and found courses varying from Computer Programming in BASIC for beginners to a course studying the computer's insides. They are held during the week, in the evenings and on Saturday mornings and usually last for two hours. The courses are spread out over 12 to 24 weeks and start in September, the beginning of the academic year. The Richmond Adult College charges £31.20 for a course lasting 24 weeks.

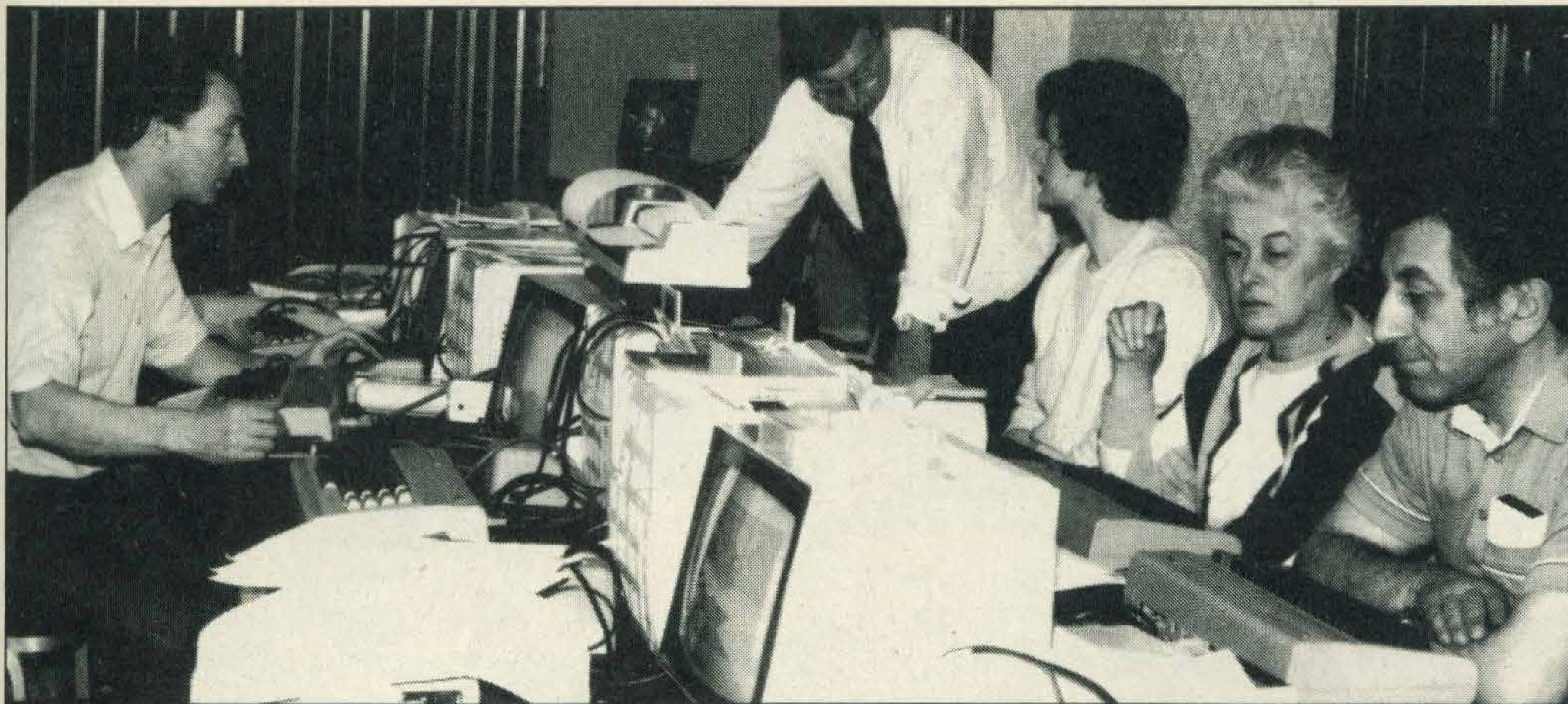
These courses will give you excellent background information on computer programming and obviously any problems you have with MSX programming can be discussed with the tutor and other members of the class. The sharing of information and problems is one of the advantages of learning in a group.



For those of you needing instant computer information, short week-end courses have multiplied in the last year and are held all over the country. The organisers usually include food and overnight accomodation in the price of the course. The classified sections of the computer magazines are a good source of this type of course.

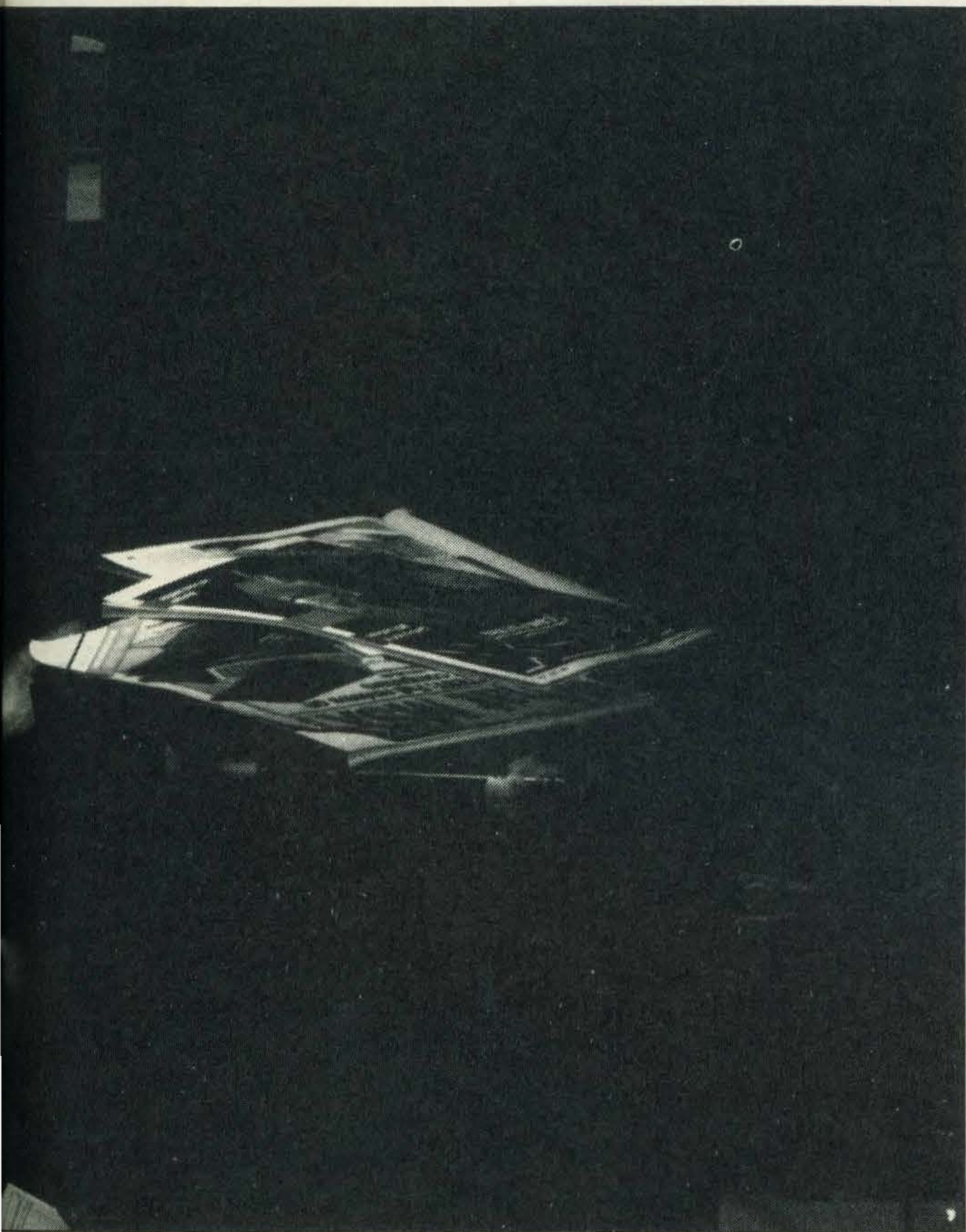
Unfortunately these are generally held on computers other than the MSX. For instance Gainsborough House based in the Severn Valley works with the Commodore 64. This probably won't present a problem, because the aim of a short course is to become familiar with computers and their potential. The Micro Learning Centre in Bournemouth actually adapt their courses for whatever computer you possess including the MSX. Prices on these computer jaunts varies, but the weekend course at Gainsborough House costs an all inclusive £70 covering Friday evening to Sunday afternoon.

Correspondence computer courses are gaining popularity and are especially useful for MSX owners either living in the middle of nowhere or who prefer to work on their own. The



We went to a computer class at Gainsborough College. A weekend's course introduced the BASIC language and programming

Video tuition is an alternative offered by Computer Television. Chris Serle is the presenter of a general introduction to the world of computing





Council for the Accreditation of Correspondence courses will give details on associations arranging approved computer courses. Wolsey Hall at the Oxford Business School runs course catering for all abilities ranging from those for complete beginners to detailed courses for competent computer professionals.

Written study units are supplemented by cassettes and these are sent to the student. Tests and written exercises have to be completed and sent back to personal tutors for correction. Examinations can be taken at the end although they are not compulsory and any urgent problems can be dealt with by phone. Course prices vary and depend on the number of subjects taken and the registration fee.

The only problem with this type of course is that the enthusiasm and incentives usually created by attending a group class are missing.

The short introductory courses give you an opportunity to familiarise yourself with computers very quickly, but if you are really bitten by the computer bug and you decide that you must know more about your computer perhaps a long course with the possibility of a recognised qualification at the end should be considered.

The local library will be an excellent source of inforrnation on course options available and the assistants are always willing to point you towards the relevant books and college prospectuses once you've explained what you want. But, first you have to decide what sort you are interested in.

Local education authorities are again the best equipped to provide you with information on computer courses. The Inner London Educational Authority (ILEA) have compiled Floodlight, a guide giving details on part time and evening classes in Inner London. It is available from ILEA for 50 pence.

Many of the courses mentioned in Floodlight lead to professional qualifications, but every ability and interest is catered for. Everything from Research degrees in Computer Science and Numerical Analysis to the Hobby Computer Club can be found.

Looking through the guide, we discovered courses on Computer Graphics, Introduction to Machine Code Programming and Z80 Machine Code. Once you've decided what your interest is all you have to do is check that you are available when the classes are held in your area! Some of them do need 'A' Level or 'O' Level qualifications before you can enrol.

If you become seriously interested in computers and are considering using the computer in the office or in a small business perhaps a vocational rather than a recreational computer course might be a good idea. These often involve taking days off work and will result in a qualification. We enquired at the library about the day release computer courses and were handed the Index of Courses of Further Education, a booklet written by the local council representing local authorities, institutions, universities and validating bodies.

Again, many of them would need A-Level or similar qualifications to join. Various types of course arrangements exist: full-time — 9 to 5 Monday to Friday; sandwich — full-time with period of time off to work in a job using skills learned; block release — the student gets time off work to study; part-time day/evening, a couple of evenings a week and flexi-study — students work and study by arrangement with the college. Most of these courses will need special arrangements with employers or, if you are unemployed, will need to be financed.



Due to the recent surge in the home computer's popularity, colleges offering computer courses have proliferated. Some are better than others and so it is important to remember that unscrupulous members of the community (often known as conmen!) do exist and that their only aim in life is to set up bogus computer colleges, prise as much money out of you as possible for very little in return.

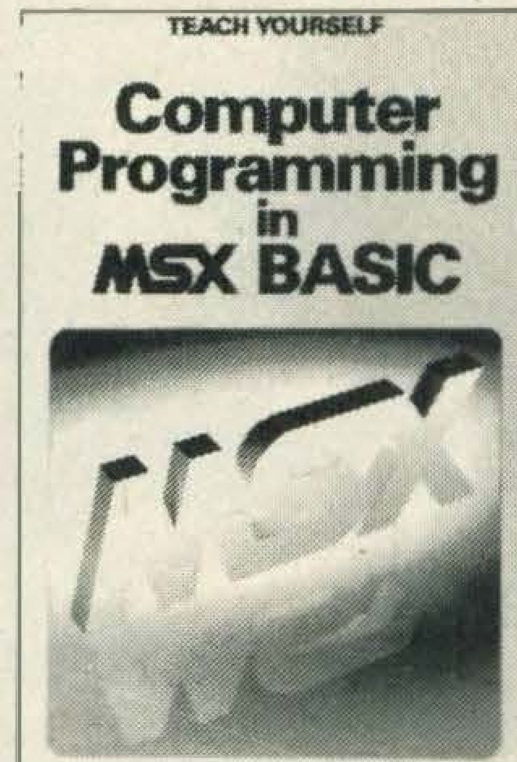
Neil Trilby, Information Officer of the British Computer Society (BCS), advised us that "if someone is really interested in becoming relatively proficient with computers, they should shop around and go for a course with recognised qualification at the end of it, the City and Guilds for example." We asked him if there was any way of distinguishing the good from the bad and Neil advised us that "one of the tricks of a bad company is to tell potential customers that they must hurry up and pay the money, otherwise the place will go." This forces people into making a decision they may regret later. "People have the right to make their own choice in their own time", said Neil. The BCS themselves hold computer proficiency examinations. Contact the BCS for further information.

Computer clubs are another good source of computer information, although according to Bill McCool, Press Officer of the National Computing Centre, they are really aimed at the "computer hackers — advanced people who treat that kind of person (computer novice) nicely — a little bit patronisingly!" In the Manchester computer club, Bill told us, they have computer query sessions where people can get help with any programming problems they may be having. They plan projects like building computers out of hairdryer motors and occasionally for light amusement one of the members gives a talk on "how I wrote a new computer language!"

Obviously not every single club in the country caters for the computer whizz kids, but generally they are made up of people with a fairly advanced knowledge. However, everyone has to start somewhere and if you're persistent enough, you will eventually find yourself to be one of the hackers!








**Books aplenty will teach you about all aspects of computing**

To find out if there is one near to you contact the Association of Computer Clubs (ACC) who will refer you to the nearest one. If they can't find one near enough, ask in local computer shops and examine library, school and church noticeboards. Local newspapers and the computer specialist press may also yield information.

Books are another good source for those of you interested in learning more about, not only your MSX computer, but about computers in general and their possible applications in both the home and office. MSX books are rapidly increasing in number.

For the complete beginner, the following books may come in handy: MSX Exposed by Joe Pritchard from Melbourne House; Teach yourself Programming in MSX BASIC from Hodder and Stoughton, and from Honeyfold Software, the Beginners Basic Course for MSX and a Beginners Assembly Course for MSX.

Programmer reference guides are essential for anyone with a computer and there should be two in the shops this month: The Complete Programmers Reference Guide by Tom Sato, P. Mapstone and I. Muriel from Melbourne House and A Programmers Guide To The MSX System by R. Goodley and C. I. Burkinshaw from Sigma Press.

For the more experienced MSX users, MSX Games Book by A. Lacey from Melbourne House, Getting More From Your MSX and Spectravideo by B. Boyde-Shaw from Sigma Press and Working With MSX BASIC by I. Sinclair from Collins may prove useful.

To obtain a general picture of the computer world it is essential that you read a wide variety of books dealing with various aspects of computers and their applications. There are many general books explaining computers, the various technologies and some of the words used in computer environments. Good examples are A Glossary of Computing Terms from the British Computer Society and The Penguin Computing Book by S. Curran and R. Curnow.

Computers have great potential in the business environment and literally hundreds of books exist on the subject. Selecting Business Software by E. Berman and L. Dewhurst from Frances Pinter, Fundamentals of Computing by G. Willmott from Heinemann and Word processing for Beginners by S. Curran from Granada may give some insight into floppy disks, data base management and the advantages of word processing.

Granada's Z80 Machine Code for Humans by A. Toothill and D. Barrow gives the reader some insight into programming short Machine Code routines and Sunshine's Applications On Your Micro by M. Grace gives the reader ideas on using a home computer in the home. Games Programming by E. Solomon, Fun Mathematics by C. Kosniowski and Creative Computer Graphics by A. Jankel and R. Morton all from Cambridge University Press give the reader ideas on using the MSX creatively.

The books we mentioned are only intended to be representative of the books in the computer sections of the book shops, but our list will give you an idea of what is available. If you can't afford to rush out and buy all the latest computer books, try your local library.

Computer Television, a company, have even produced a video called Easy Microcomputing, costing £19.95 which aims to educate the beginner in computing. Presented by Chris Serle of 'That's Life' and 'In at the Deep End' fame, the tape gives the viewer information on the basics of computing, why he or she should computerise and gives details on specific applications.

With all the ideas, advice and information we have given you, you and your MSX should soon be inseparable! There is a lot more to computers than playing games and with the superb Microsoft extended BASIC language and the excellent sound and graphics capabilities you should soon be creating your own games and programs. ■

## ADDRESSES

**Association of Computer Clubs**
17 Lawrie Park Crescent
London SE26 6HH
Tel: 01 370 0601

**British Computer Society**
13 Mansfield Street
London W1
Tel: 01-637 0471

**Computer Television**
9 Cavendish Square
London W1
Tel: 01 580 6363

**Council for the Accreditation of Computer Colleges**
27 Marylebone Road
London NW1 5JS
Tel: 01 935 5391

**Gainsborough House**
Bewdley Hill
Kidderminster
Worcs DY11 6BS
Tel: (0562) 754041

**I.L.E.A.**
Room 77
County Hall
London W1
Tel: 01 633 1066

**Index of Courses for Further Education**
Tavistock House South
Tavistock Square
London WC1 9LR
Tel: 01 388 0027

**Micro Learning Centre**
10 St Swithins Road South
Bournemouth
Dorset BA1 3RQ
Tel: (0202) 290677

**National Computing Centre**
Oxford Road
Manchester M1 7ED
Tel: (061) 228 6333

**Richmond Adult College**
Clifden Road
Twickenham
Tel: 01 892 2303

**Wolsey Hall**
66 Banbury Road
Oxford OX2 6PR
Tel: (0865) 54231

# COME TO TERMS WITH COMPUTERS

**Computer buffs speak a language all their own. Here's a guide to the jargon that should enable you to bluff your way through any computer club conversation**

**Go to a computer show and listen to the conversations. It's a whole new language, isn't it? There's talk of mice, handshakes, buses, ports, flags, loops, clocks, bits, desktops — enough to make you think that computer buffs have taken leave of their senses. You, the newcomer to computing, seem to have little chance convincing the experts that you know what you're talking about. The name of the game is jargon.**

Bluffing your way to becoming an apparent expert on computers isn't difficult. You can then hold your own when the talk turns to computers. Once you gain admittance to a clique of computer buffs, you'll soon start to pick up real computeracy. Providing you don't lose sight of the fact that not everyone speaks the jargon, you should then be able to talk about computers to anybody.

The first thing to do is to start using computer buzzwords in normal conversation. You don't 'connect' your TV and video — you 'interface' them. You don't 'look up information' — you 'access data'. Such terms show that you are into computers.

The image is further strengthened if your briefcase starts to bulge with computer magazines. Spend time browsing through computer magazines in Smiths and borrow computer books from the public library. If they are on subjects such as



databases, Machine Code programming and so on, so much the better.

Gamesmanship consists of knowing what the best selling game are, being able to load games into your computer and managing to get onto the high score table of at least two games. Alternatively, know what happens in a popular adventure after the first thirty moves or so (this can be garnered from games players or games reviews).

All that then remains is to have a grasp of the fundamentals of computing. So, pen and paper ready . . . here we go.

Get your pronunciation right from the start. If in doubt, consult a computing dictionary (an essential requirement for heavy bluffing). Be sure you can say things like algorithm, baud (rhymes with bored) and heuristic without faltering. Your computer is a micro, meaning that the computing circuitry is all on one silicon chip, a microprocessor. Strictly speaking, you have a home micro. A desktop micro is designed for the business user, so costs more and is better suited to business software. A mainframe is the sort of computer that stores DHSS or DVLC records and databases such as Prestel. You might access the latter to get information, or try and break into (hack into) the former.

**'Be sure you can say things like algorithm, baud (rhymes with bored) and heuristic without faltering'**

The computer and peripherals you add to it are the hardware. Programs are software, unless they are built into the computer, in which case they are firmware.

The inside of a micro is filled with all sorts of jargon-inducing goodies. Acronyms are the rage. There's the PCB, the printed circuit board on which all the components are mounted. There's the CPU, or Central Processing Unit. That's the computing bit of the computer. In MSX machines it is an eight bit Z80A processor. Other types of eight bit processor are the 6809 and 6502. The Z80A is used in computers such as the Sinclair Spectrum.

Eight bit means that the processor handles data in batches or words of eight bits. A bit, short for binary digit, is the smallest unit of data. Eight bits make a byte, four bits make a nibble. A Kilobyte, often abbreviated to K, is 1024 bytes. An Mbyte, or Megabyte is colloquially a million bytes but strictly speaking 1024 × 1024 or 1,048,576 bytes. A Gigabyte is 1024 Mbytes, or a heck of a lot of memory. MSX computers are designed with a maximum capacity of a Megabyte. All these odd numbers have to do with the binary number base at the heart of all computing. Other number bases to know about are octal (base eight) and Hexadecimal (base 16). This numbering system goes 1,2,3,4,5,6,7, 8,9,A,B,C,D,E,F,10 and so on. Numbers in this form are prefixed by hex or hash. A familiarity with these number systems is a sure sign of computeracy.

Computer memory is divided into ROM and RAM. ROM is Read Only Memory — instructions that are permanently embedded in the microchip and can't be changed. They control the way the micro works. RAM is Random Access Memory. It is similar to ROM, but its contents are lost when the power is turned off. It is the area occupied by programs. Generally, the greater the RAM the more the computer can store. Most MSX machines have 64K RAM.

MSX micros also have 16K of VRAM, Video Random Access Memory. This is the area where data for the video display is stored. VDP is another useful acronym, standing for Video Display Processor. In MSX micros this is a Texas Instruments 9918A chip.

Another important chip is the General Instruments AY-3-8910. This generates the sound in an MSX computer.

When you start talking about the workings of microprocessors, you start into another level of jargon. For a start there is the clock speed of the processor, measured in MegaHertz or MHz. The MSX processor runs at 3.6MHz. The higher this number, the better.




A bus is the channel along which data is transmitted. Data travels from one address to another, altering flags (processor status indicators), registers and indices. Addresses are arranged in pages of 1024 (binary at work) locations, so you'll hear talk of page zero and so on.

Eight bit processors handle words of eight bits. More advanced are sixteen bit processors, handling data in 16 bit blocks. The Z8000 and Intel 8088 are 16 bit processors. 32 bit processors handle 32 bit words. The Motorola 68000 is a 32 bit chip.

There are other types of silicon chip too. EPROM is a term you may come across. It stands for Erasable Programmable ROM. It is a chip on which the ROM can be erased by ultra violet light. A PROM can't have its memory erased.

If RAM needs to be stored, a CMOS or Coated Metal Oxide Semi-conductor can be used. With a small power source, this can store data or programmes when the computer is turned off. Bubble memory is another non-volatile (i.e. power independent) memory storage method. It uses arrays of bubbles in a magnetic material to store information.

LSI stands for Large Scale Integration, and is the means by which by up to 1000 electronic components are reduced to one chip. VLSI, Very Large Scale Integration, is getting up to one million electronic components on a single chip. ULSI (Ultra LSI) is getting over a million components on a chip.

If you really want to talk futuristically, read up on biochips — microchips of the future to be carbon-based and able to grow their own components!

Getting back to the present, some programming jargon always comes in handy. Languages are the starting point and BASIC is the language of your MSX micro. BASIC stands for Beginners' All purpose Symbolic Instruction Code. It is a high level language, meaning it is quite close to English.

To operate a BASIC program, the computer uses a BASIC interpreter, converting BASIC instructions to Machine Code. Machine Code is the language the microprocessor responds to. It can be written with an assembler, converting labels and acronyms entered by the programmer to the hexadecimal language of the computer.

BASIC is an interpreted language, as is FORTRAN. Other languages are compiled. The computer starts with a few primitive commands and the programmer builds new commands using the primitives. To run a program, the computer analyses the high level commands, breaking them down into primitives and executing these. compiled languages include Forth, LISP and COBOL.

A program is a sequence of instructions to the computer. If a program doesn't run correctly, then it probably has a bug in it. Debugging programs is what keeps programmers up all hours of the night. With two days stubble, bags under the eyes and a sallow complexion, you can easily pass as a demon programmer.

Programs are described as portable if they can be used on a range of different machines. MSX programs are portable, as are business programs written under an operating system such as CP/M or UNIX.

An operating system is a series of programs that operates a computer system of terminals, printers, disk drives and so on. Booting up is entering an operating system into the computer.

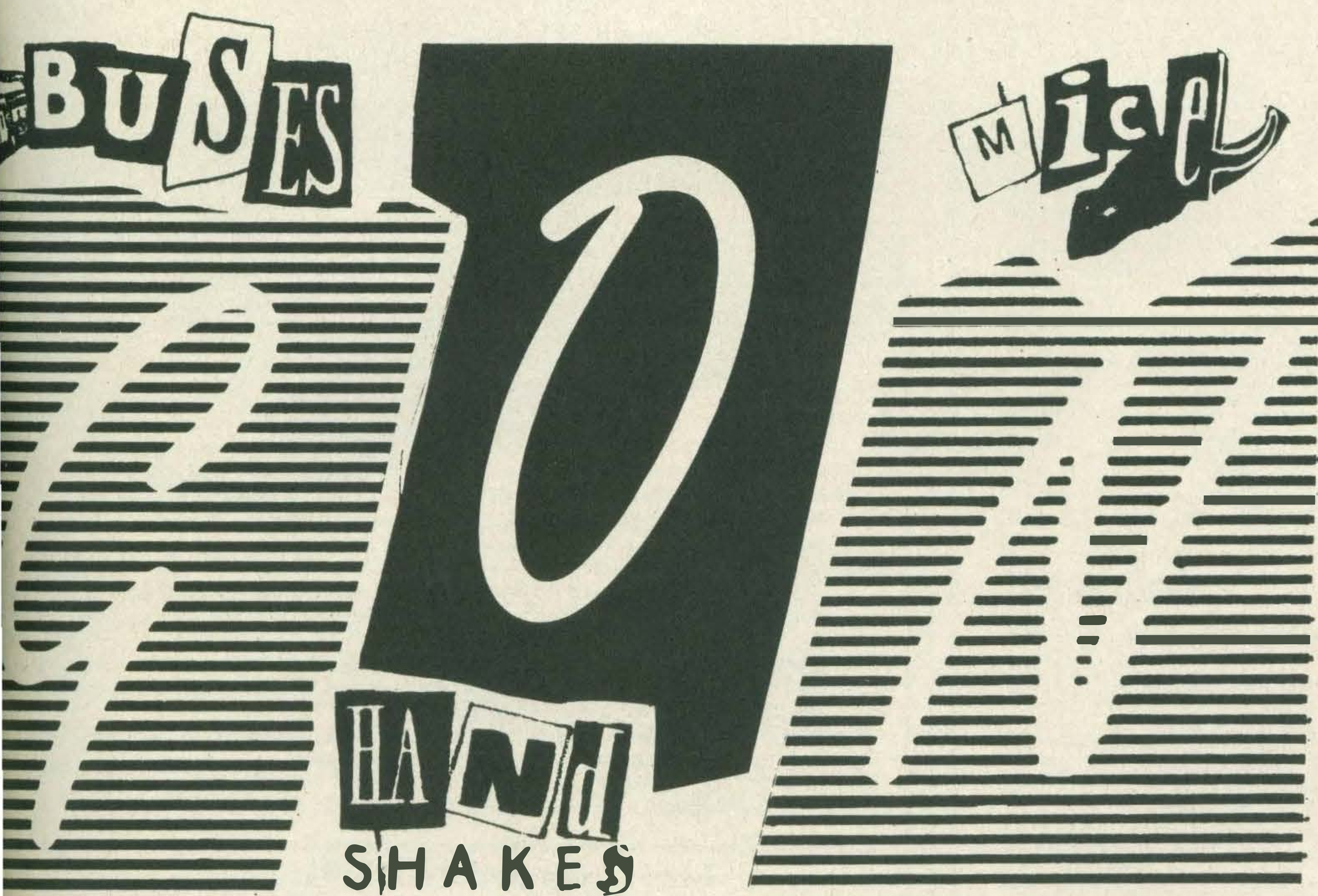
That brings us rather neatly to the world of peripherals. A peripheral is anything you attach to a computer. Some of the terms are pretty self-explanatory — joystick and printer for example — but there are myriads of other terms to pick up.

A monitor is the generic term for the visual display unit or VDU. CRT (Cathode Ray Tube) is a synonomous term. A monochrome monitor is a black and white set. Green screen monitors have a green screen that is designed to make them easier to look at for long periods. The output to a monitor is, in this country, a composite video or PAL signal. The socket for the cable may be labelled RF, standing for Radio Frequency Other standards include NTSC and Peritel.

RGB is the other video output and needs a special socket. It gives separate outputs of red, green and blue signals, driving the three cathode ray guns in the colour monitor directly and giving optimum image quality.

The keyboard is used to enter text on the screen. A standard keyboard is described as a QWERTY type, after the first six alphabet keys. Alternative means to communicate with the computer exist too. For instance, a touch screen is a special screen by which pointing at a symbol being displayed (an icon) initiates an action. A mouse is a device that you move about on the desk; as it moves, the cursor moves on the screen. A light pen is a type of pen that 'draws' on the screen, and is an accessory available for MSX micros. Then there is the touch pad — touch sections of it to do different things. That's available for MSX too.

Programs are stored on a variety of media. For the home user, cassette tape is the most common. Greater storage capacity is possible on disks coated with a magnetized metal oxide. The disk (note the spelling) formats vary, with popular sizes being 8", 5¼", 3½" and 3". The first two are known as floppy disks. Hard disks are non-bendable and hold vast amounts of data. Also known as Winchesters, they are for large business computers.




The cartridge is an alternative to disk storage, containing a ROM chip with the program written on it. Disk drives, cartridges and so on are connected to the computer via the I/O (In/Out) port. That has 50 pins or contacts on MSX computers.

The other major interfaces are described as serial or parallel. RS-232C and Centronics are equivalent terms. Serial means that data is sent in a long stream, one bit after the other. Parallel means that data is sent down eight parallel wires, one byte at a time.

Printers are connected to these ports. There are, of course, several different varieties of printer. Daisy wheel printers have a spoked, circular wheel with a character at end of each spoke. To change to different types of characters, you have to change the daisywheel. Dot matrix printers use a grid of tiny pins to print any character at all. These printers are faster but the quality is not so high. Thermal printers rely on heat to transfer ink to the page, or bring out characters on a sheet of special paper.

**'There are many books to educate you and computer buffs are usually only too willing to enlighten you about their hobby'**

The last major class of peripheral is concerned with computer communications. The basic tool here is the modem, short for modulator/ demodulator. This converts (modulates) signals from the computer to audible tones that are sent down a telephone line and converts these tones back to binary data at the receiving end. A Baud is the measure of data transfer speed, a figure like 1200/75 indicating that signals are sent at 75 baud and received at 1200 baud. 300 baud is another common speed. A full duplex modem is able to receive and send signals simultaneously, a half duplex modem can do only one or the other.

Those, then, are just some of the terms you'll come across when you start talking computers. There are hundreds more too, particularly when you start investigating robotics, Artificial Intelligence (AI) and the frontiers of developing technology. Still, there are many books to educate you and you'll find that computer buffs are usually only too willing to enlighten you about their hobby. Just remember one thing though: it is easy enough to bluff your way in Computerese, but blinding a novice with science is a good way to put them off for ever. ■

## Advertisers Index





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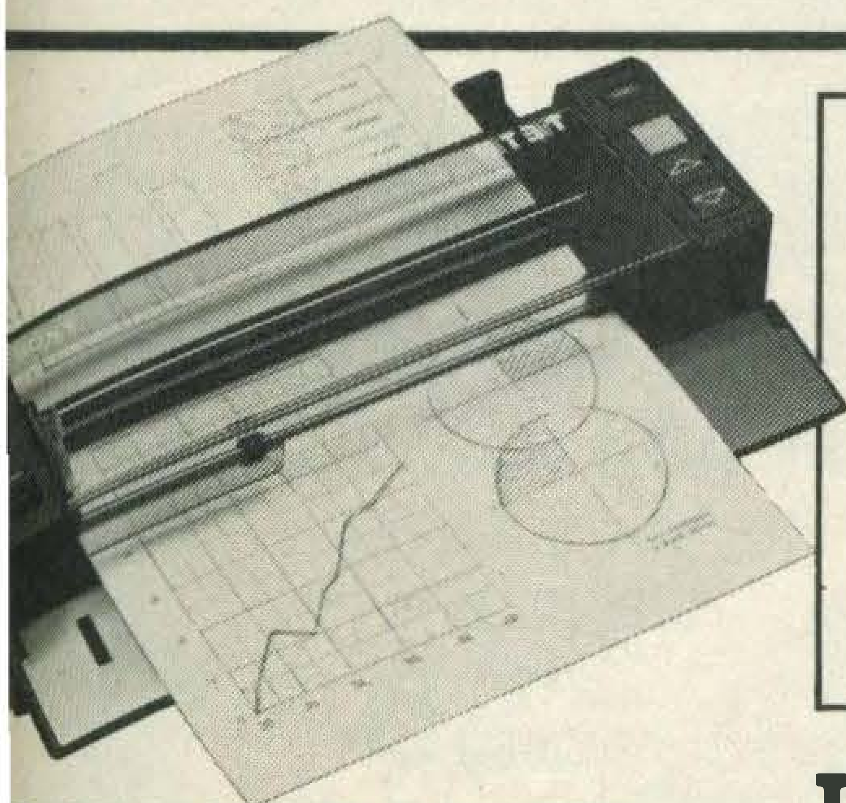
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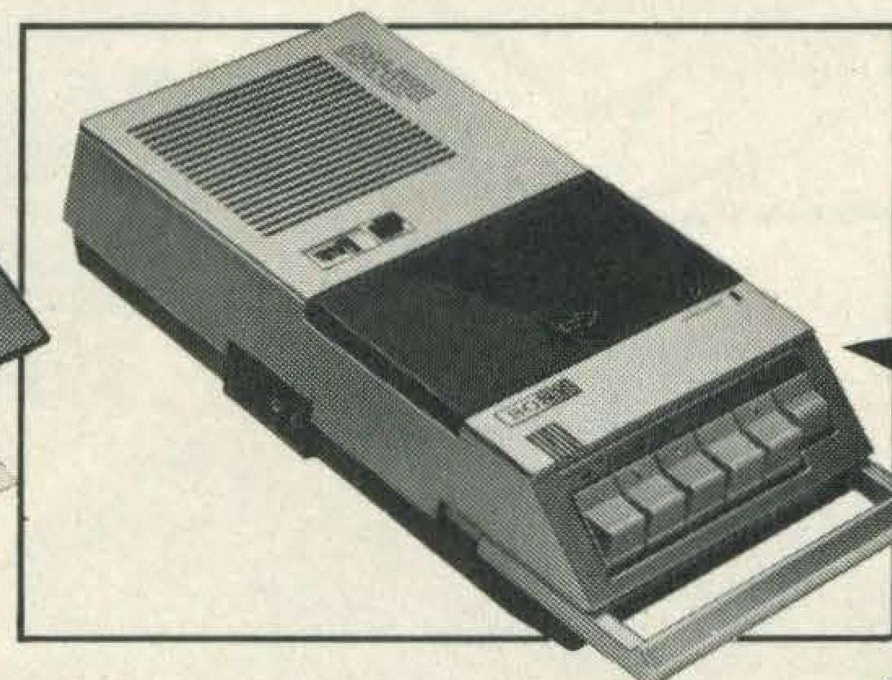
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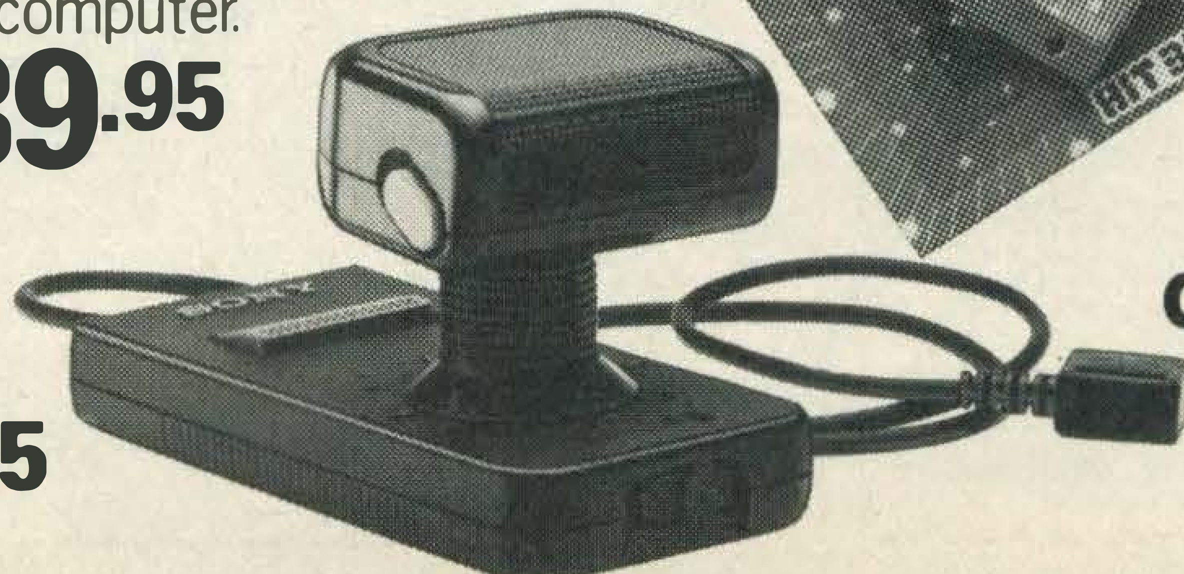
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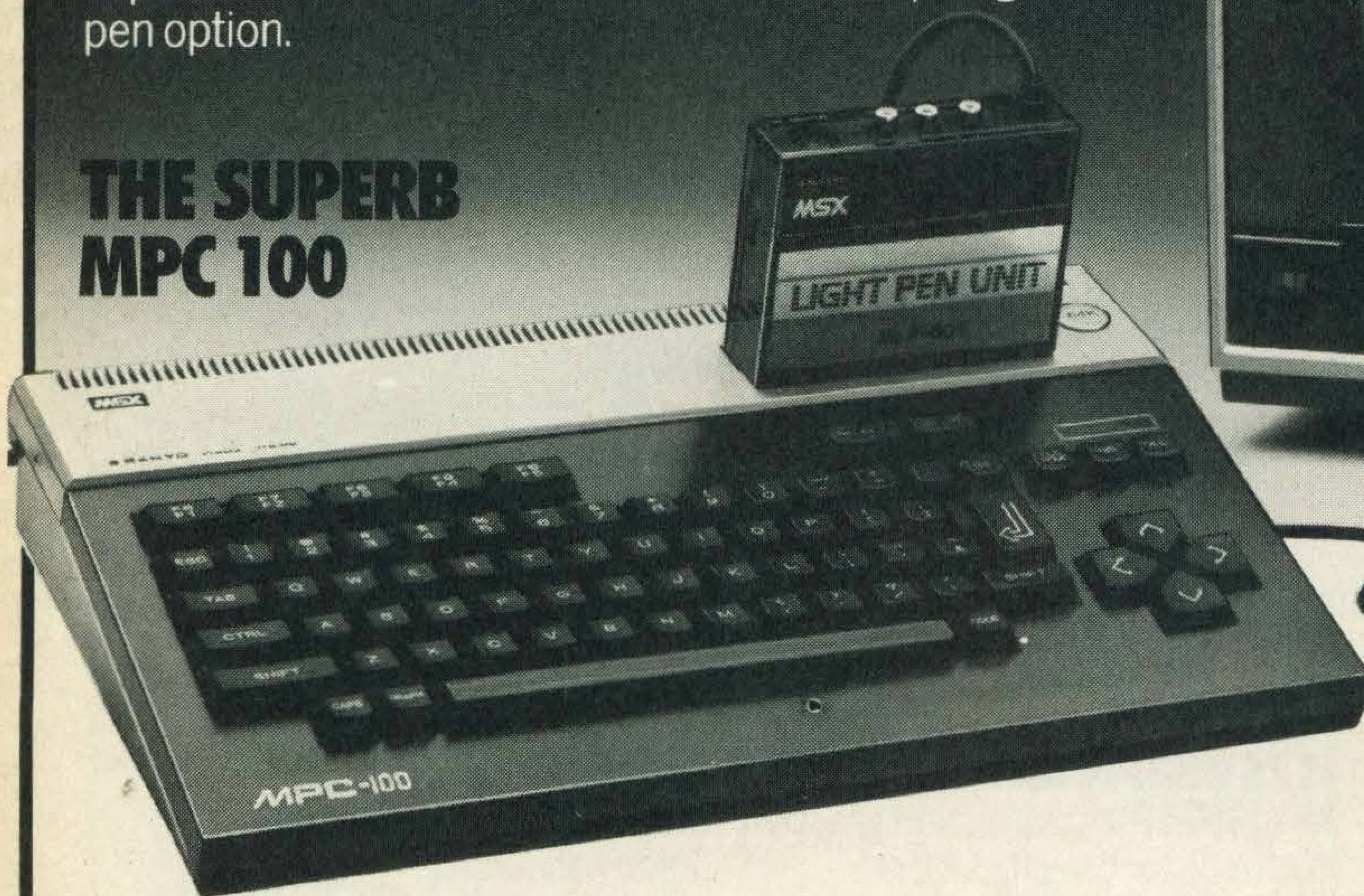



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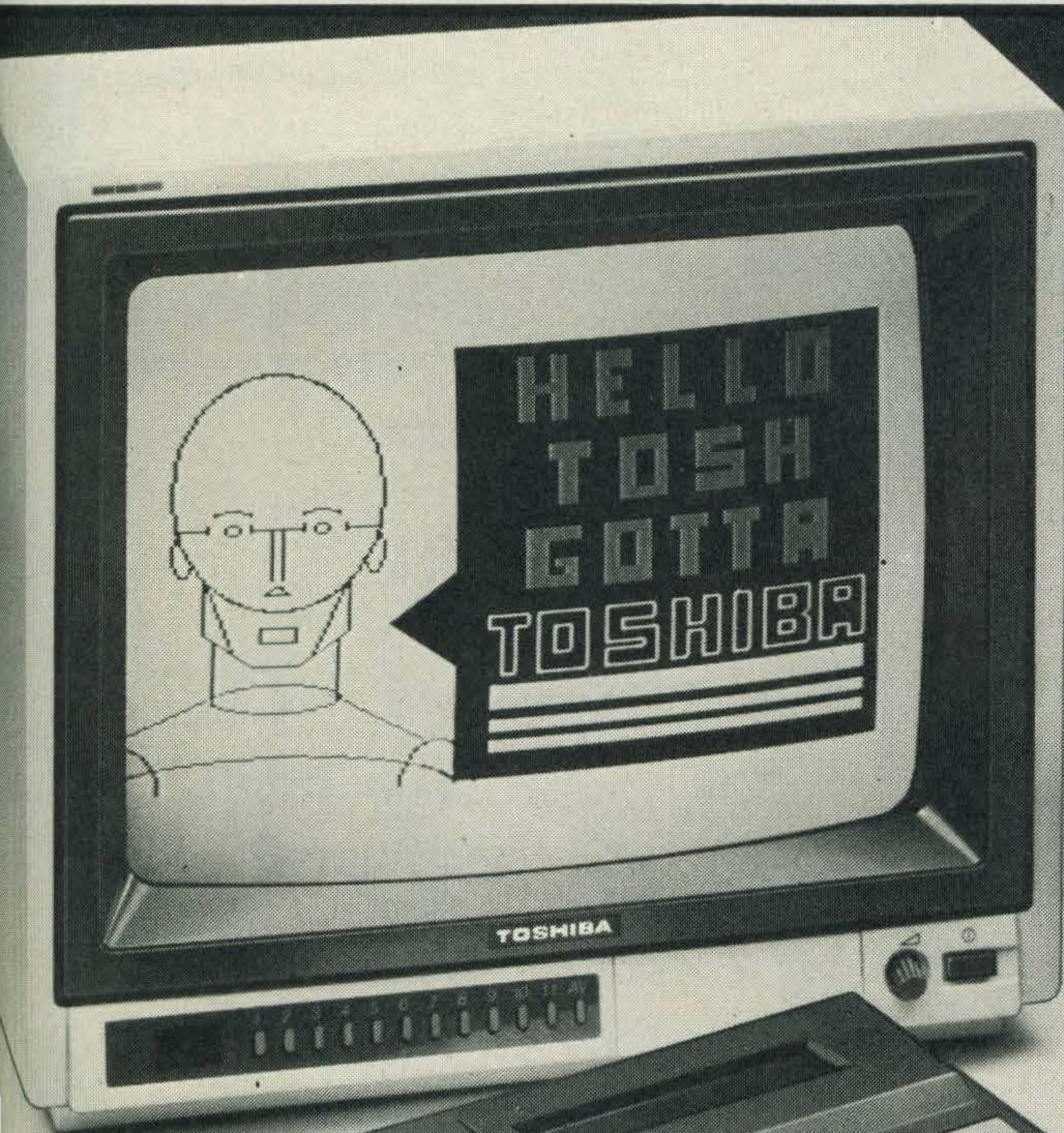
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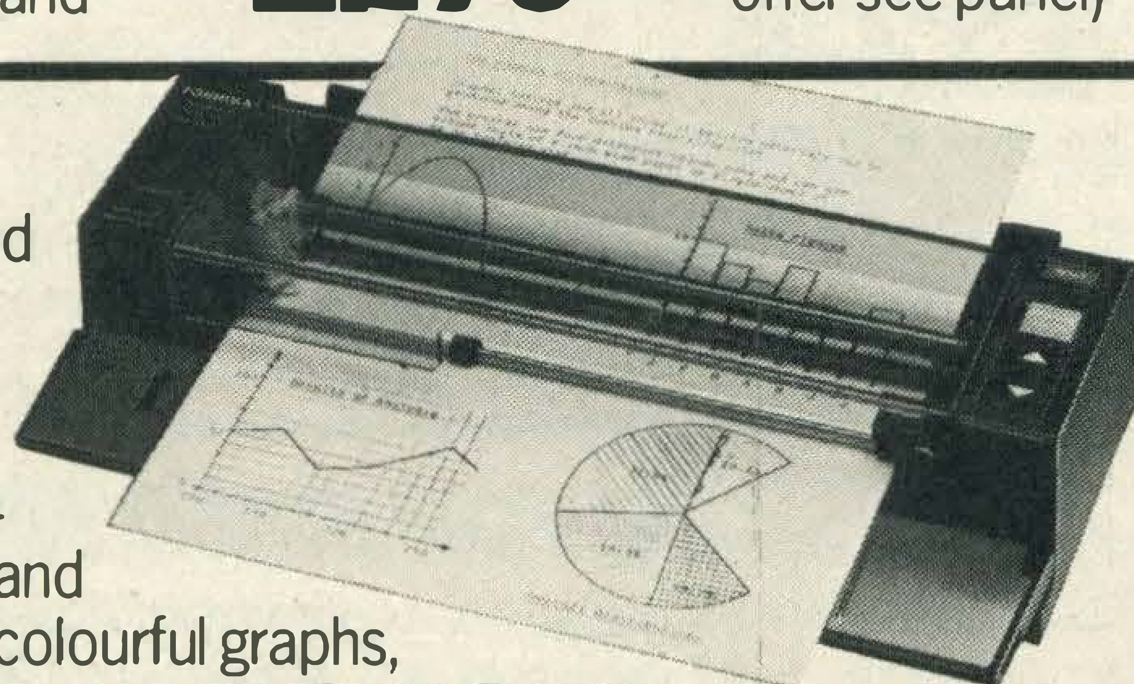
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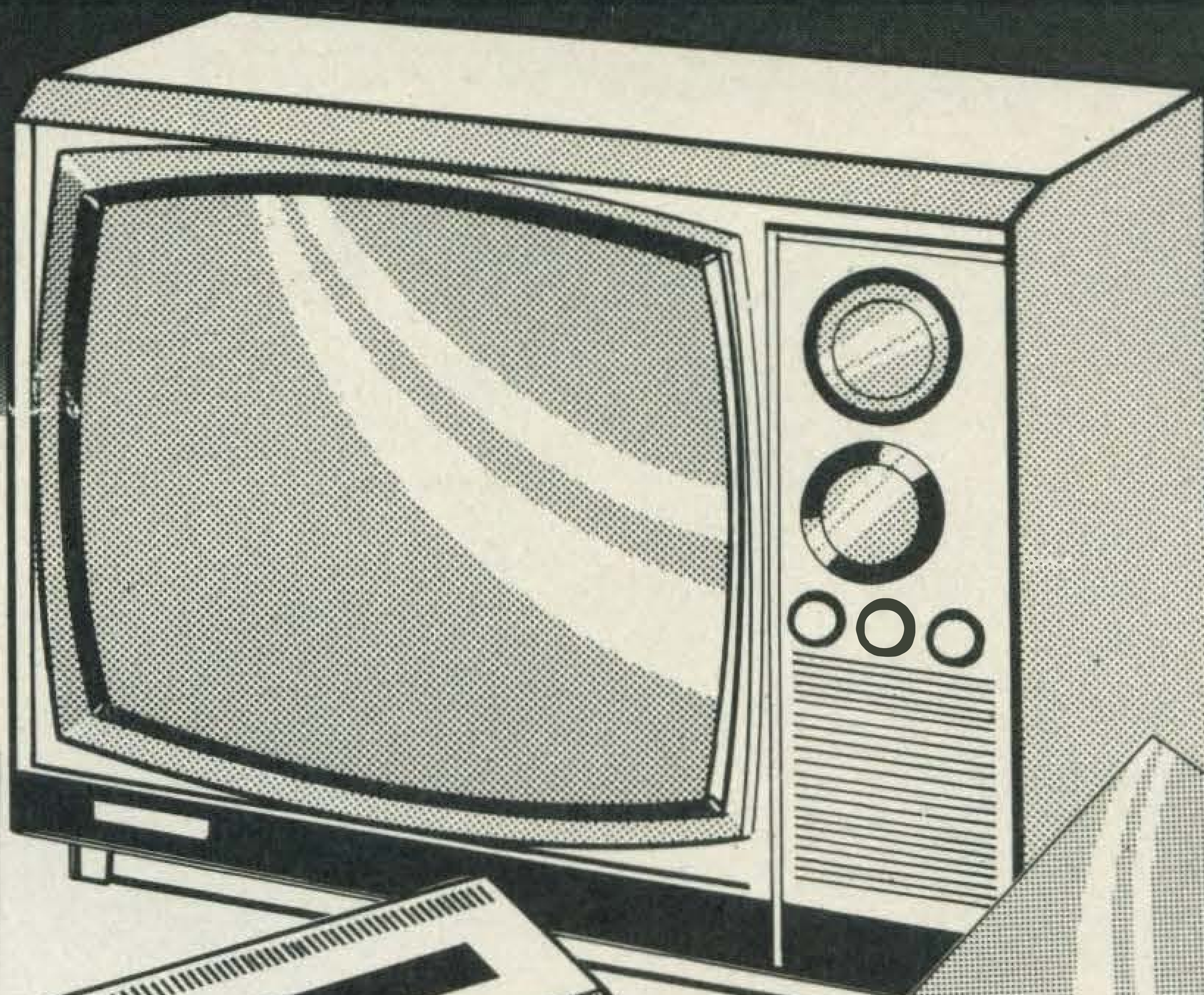
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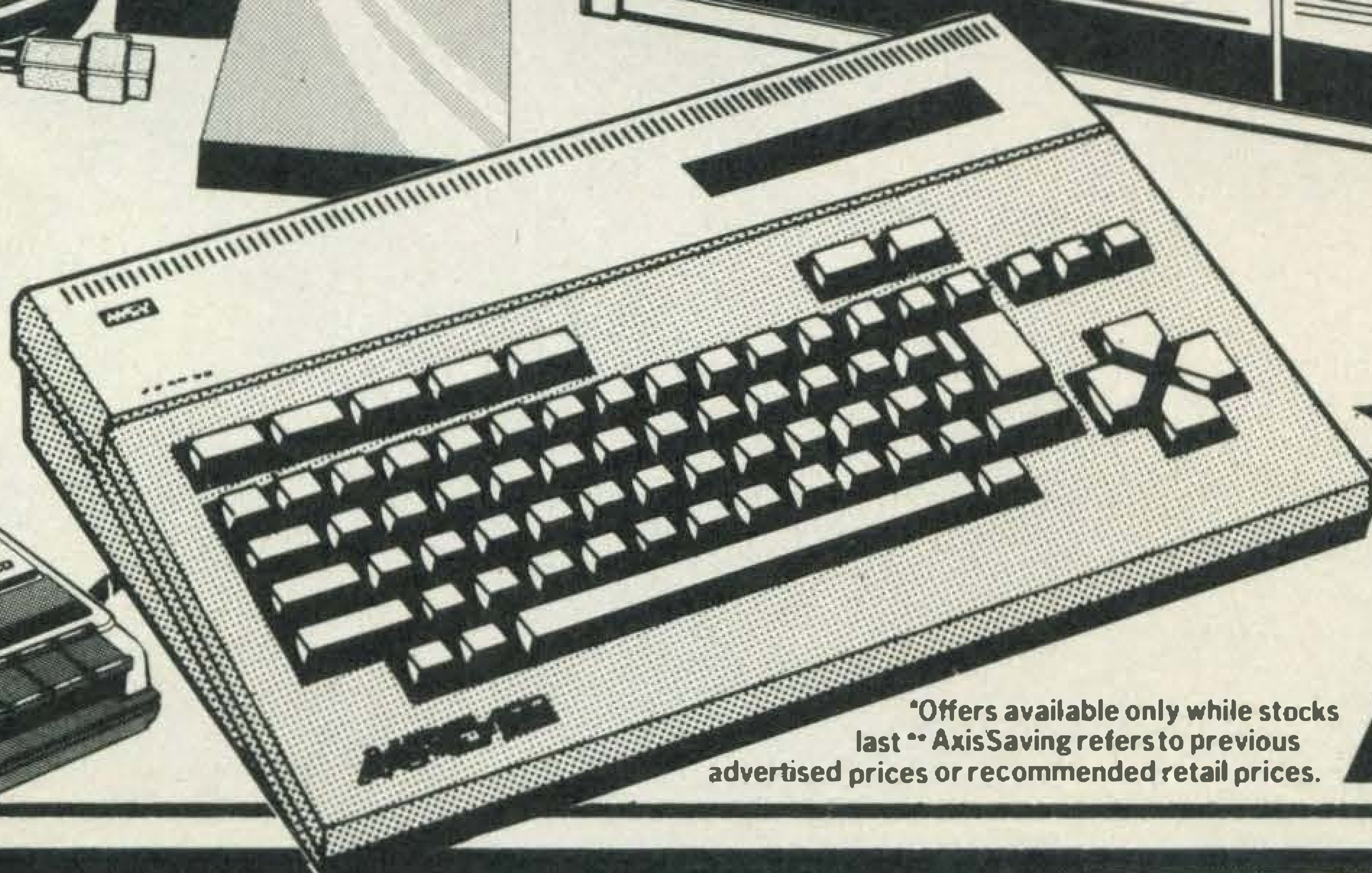
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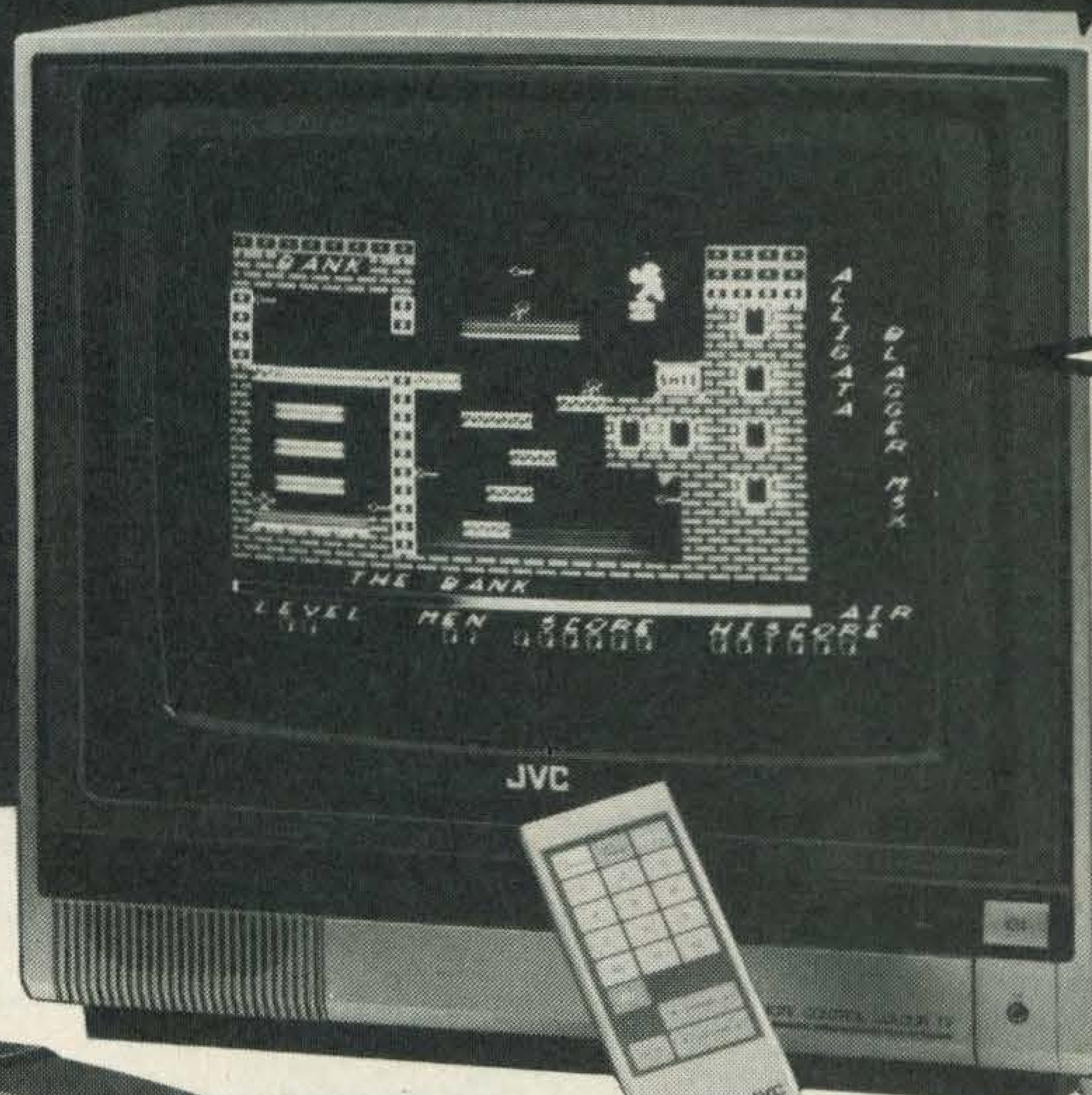
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# NAME THAT GAME




**Though there are hundreds of computer games available, many of them fall into definite groups. Here's a guide to game types.**

**Take a garage, two computer enthusiasts, inspiration, some free time and a rather primitive computerised Ping Pong game, mix them together and you've got yourself the start of a massive computer game industry, producing hundreds of computer games on every imaginable topic under the sun!**

The computer game craze all started when two men, Steve Wozniak and fellow computer hobbyist Steve Job spent their free time building the ping pong game in a garage. Thinking that electronic ping pong could have commercial possibilities, they installed it in the local cafe to test public reaction.

Within hours the cafe owner had called to say that there was something wrong. So, in trepidation, they went back to investigate the problem and found that the coin box was completely jammed up with coins! The game had proved an overwhelming success.

Nowadays it is difficult to imagine anyone actually enjoying hitting little white balls back and forth with rectangular bats, but for a public bored with table football and pinball, the computerised arcade game idea caught on quickly.

Soon games like Breakout appeared — another ball game, that was slightly more sophisticated than ping pong. Similar in principle to squash, one or two players had to hit balls against a wall of coloured bricks. The ball bounced back at unpredicatable angles, introducing an element of surprise and skill into the games.

Following closely on Breakout's trail came the Space Invader-type games. Arcade game popularity really got off the ground with these games. Addicts squandered pocket money, pay packets, life savings, marriages . . . anything and everything just to keep up the extermination of invading alien hordes. Then the rest arrived; Galaxians, Pole Position, Scrambler, Frogger, Donkey Kong — to name but a few. They poured into the amusement arcades, pubs, restaurants . . . everywhere! Gone were the penny arcade games. Amusement halls were never going to be the same after the microchip.

As arcade games were becoming more diverse and sophisticated, so the home computer industry was also flourishing. One of the main reasons for investing in a home computer was so that penniless arcade fanatics could sit in front of their televisions and play games to their hearts content, without needing to constantly pour silver coins down a coin slot!

Of course a lot of people realised the potential of the home computer, quickly formed software companies and produced vast numbers of computer games. Most are versions or copies of original arcade games, but as programming techniques improved and new ideas were added to the old, the number of game categories as well as game quality increased.

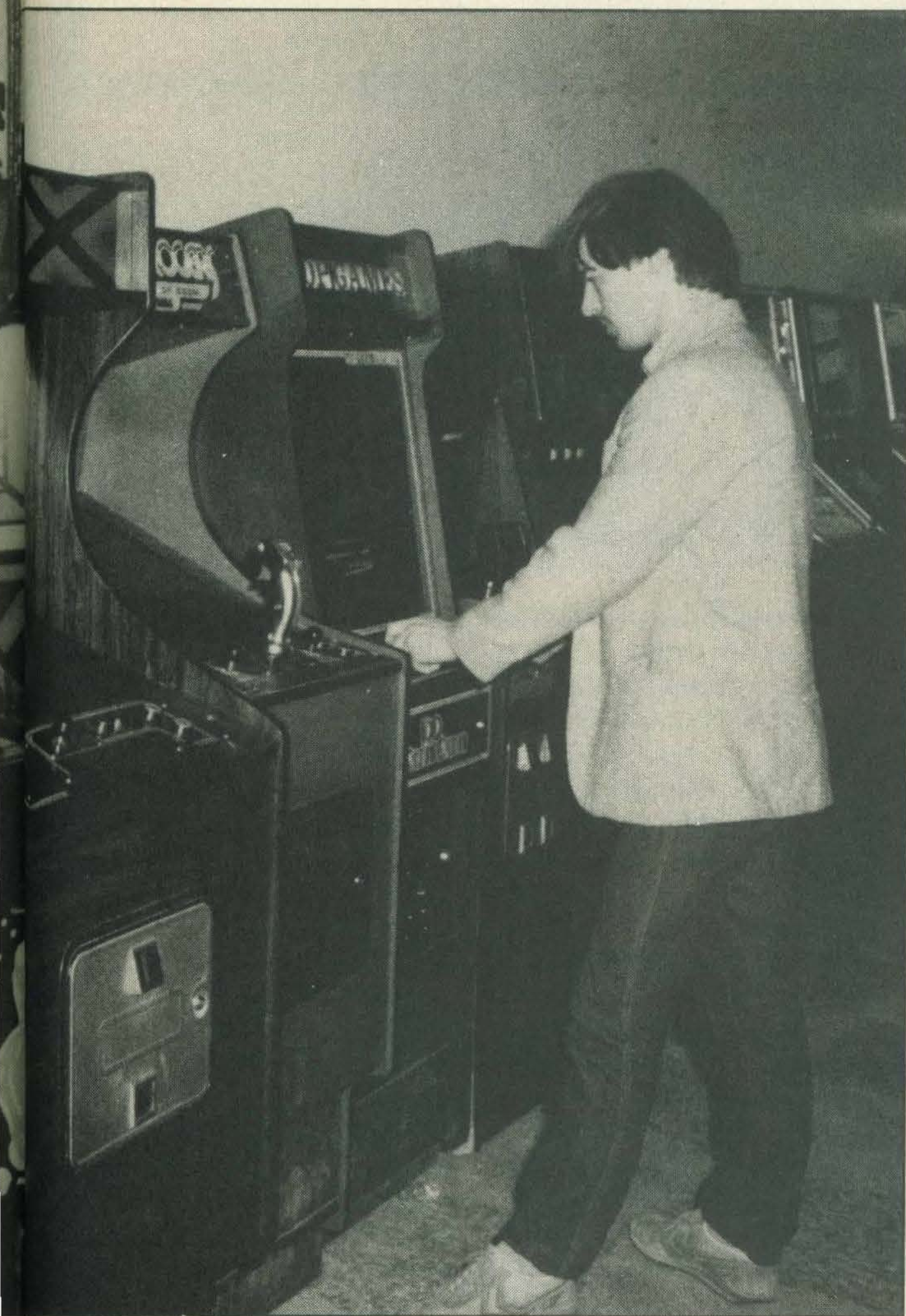
No longer do we just have the arcade-type games. Games can be categorised as adventures, strategies, traditional, educational, sports or simulations. The ideas used in these games often overlap, producing hybrids such as arcade/strategies, arcade/adventures and even semi-educational/traditional games!

Choosing a game depends very much on personal preference. In the *What MSX?* office some of us prefer to spend our days mindlessly zapping alien Klingons in games like Battleship Clapton II whereas others prefer the gentler attraction of guiding a happy little boy over lily ponds and water fountains as in Adventure Playground.

It is all too easy for the computer novice eager to play games on a newly unwrapped MSX computer to dash out and buy pounds worth of software which turns out to be pretty awful.

By knowing the game groups you can more easily decide which games are worth buying.

The vast majority of games can be put into the arcade category. Popular amusement arcade games are the inspiration for many of them. You control the movement of an object or character, be it penguin, pacman, mutated zombie or flea, using either the



keyboard or a joystick.

Mindless massacres and evasive tactics are often involved in these games — not always — just most of the time! Speedy reflexes, impeccable hand to eye control, nerves of steel, long hours of practice and a great deal of patience are the qualities needed to master these games.

Within the Arcade category are many sub groupings. Some are recognised by experts as arcade classics and consequently imitated by many.

Arcade/adventures games are a hybrid. They are arcade in the sense that a character has to move around different locations dodging objects such as flying beds and an adventure because the character has a task or quest to complete. Pure arcade games never end whereas arcade/adventures do have a definite goal.

Manic Miner, Jet Set Willy and Pitfall II are typical of this group, although with more arcade action than adventure.

Asteroids was one of the earlier space games. The player has control of a manoeuvrable space ship which dashes all over the screen zapping or avoiding asteroids.

Many games use this idea. In Time Pilot the aircraft annihilates everything in the sky, and in Battleship Clapton II the player manipulates a spacecraft through space shooting multicoloured alien beings.

In Centipede games the player has to whizz round a maze scenario chasing centipede snakes. Hitting the snakes in the middle causes them to split in two — doubly dangerous. Life is made more difficult by monsters in pursuit. Hyper Viper is a game of this type.

Donkey Kong is a very well known arcade game and has been the inspiration for many platform games. The screen is divided by platform, liberally sprinkled with obstacles and connected by ladders. Descendents of the game feature lifts, ropes, holes in the floor. A fair damsel can only be rescued by climbing to the top and defeating an aggressive gorilla.

Hundreds of platform games exist — Nug-it, Chuckie Egg and in games like Jet Set Willy the game extends into several screens and becomes more complicated.

If guiding frogs safely over busy roads and crocodile-infested rivers is your idea of fun, then a frogger game is the one for you. Good timing and snappy thinking are needed. The road and river both run across the screen and your frog has to cross them by going from the bottom of the screen to the top.

Beamrider and Waffle are typical grid games. In Beamrider the player is caught up on a neon blue grid in the firing line of enemy projectiles and can either dodge or shoot back. An element of strategy is involved.

Star Trek, perhaps the most famous example of a grid game, has the player moving around from space sector to space sector destroying Klingons and other space creatures. The galaxy is a great deal larger than one screen, so to move around the player has to give grid references as well as warp factors and directions.

Anyone familiar with the arcades will remember Hunchback. The ugly hunchback crosses several screens jumping over spears, gaps in the floor and other assorted nasties. After about 20 different screens, the Hunchback rescues the princess. Punchy is similar except that a policeman is trying to rescue Judy.

## 'Pure arcade games never end whereas arcade/adventures do have a definite goal to achieve'

The Hunchback idea is found in many arcade games. The characters or objects move either up or across the screen, but have no offensive potential. Avoidance of things is the key to success.

Other games using the Hunchback idea are Antarctic Adventure where the penguin has to move up the screen jumping ice crevasses or avoiding walruses, and Comic Bakery, where the baker has to run back and forth kicking furry racoons and switching the bread conveyor belt on.

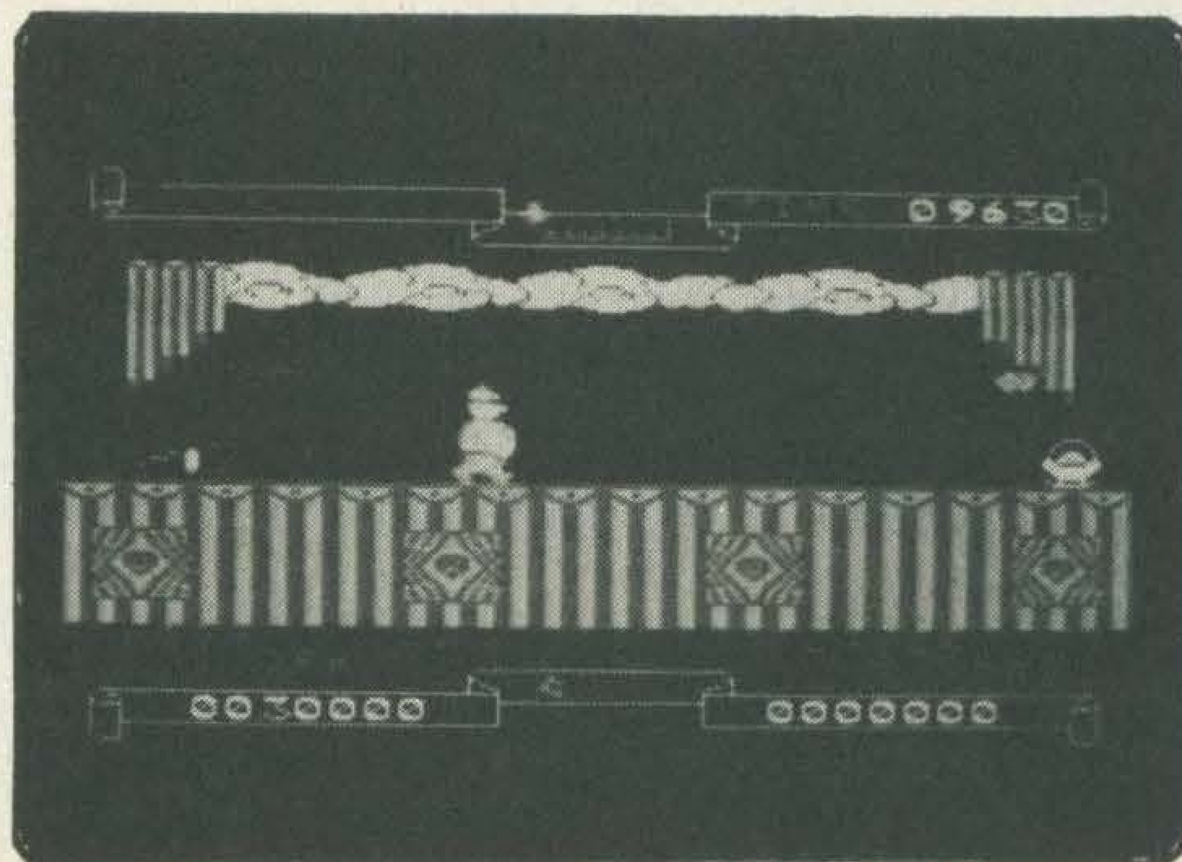
Any game with a variety of screens, each with a set task, is a multi-screen game. Blagger, Manic Miner and Jet Set Willy are good multi-screen games.

Pacman, the maze game is the precursor of all maze games. The player steers round a maze gobbling dots and power pills while evading monsters.

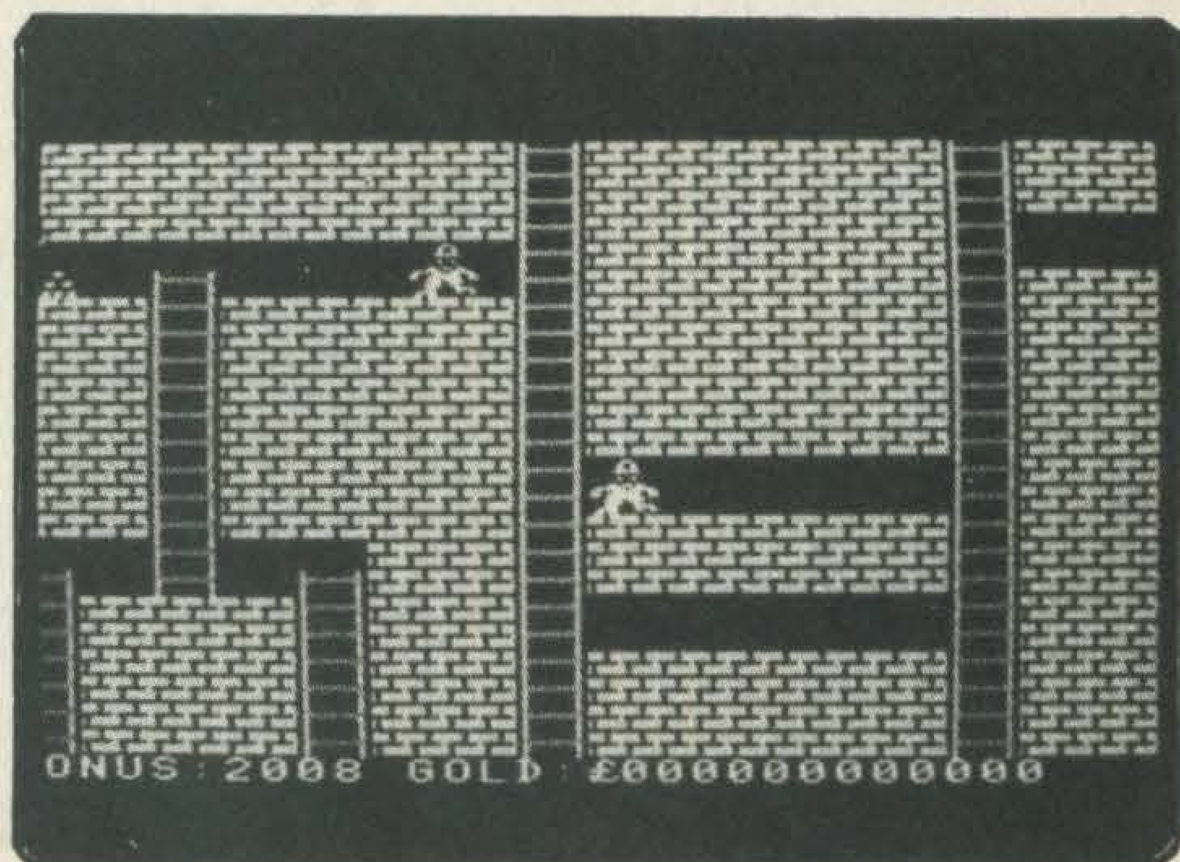
Examples of the maze game include Pyramid Warp, Oh Mummy, Packie, Sparkie and

>>>>

HUNCHBACK-TYPE




PLATFORM



Binary Land. Different characters and themes are used in each game, but the same sort of maze scenario is involved.

Scramble is a firm favourite with arcade fans who thrive on excitement, fast movements and hit or die firing skills. A space ship is piloted over mountains, valleys and through caverns avoiding missiles, meteors and other assorted killers. Super Cobra and Star Avenger are excellent examples of this type of arcade game.

River Raid is a sort of vertical Scramble with the jet fighter travelling up the screen.

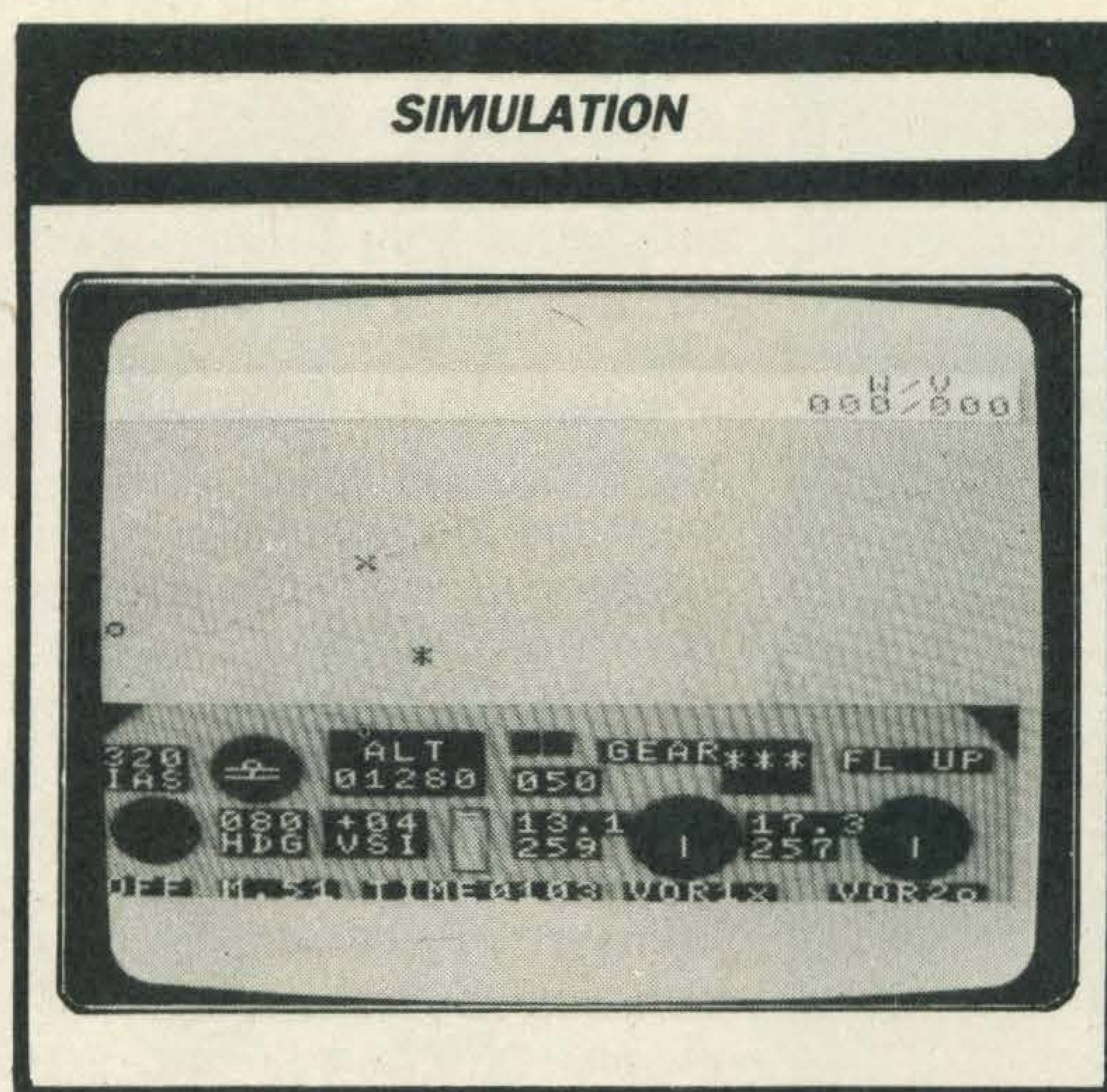
Space Invaders is so famous it hardly needs an explanation! The player moves a rocket launcher from left to right blasting rows of aliens as they move down from the top of the screen. Maxima is a typical Space Invader game.

Adapted versions include Galaxians where the aliens swerve and wheel as they descend and Polar Star where the space ship can move up the screen to attack oncoming ships.

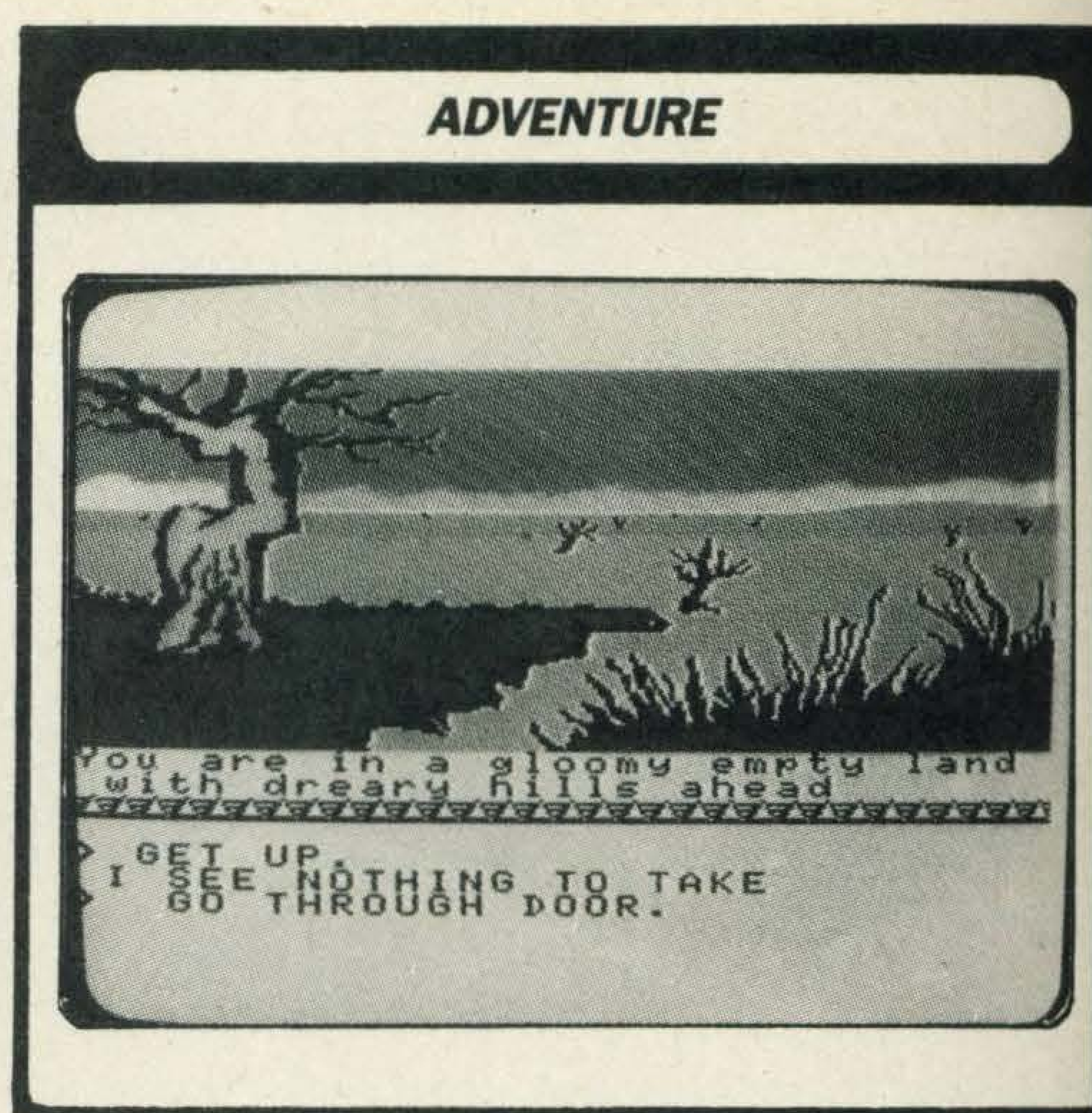
A spatial game is one in which the player has a fairly wide open space to manipulate the character or object around in.

Spatial games include Shark Hunter which involves an eskimo jumping about on ice floes protecting his fish nets from the sharks and Buzz Off which has a blue insect flying all over the screen scoffing colourful fruit which instantly turns into fatal cobwebs.

In a Q-Bert game, the player is presented with a 3-D pyramid of blocks which change colour when touched. Coils and vindictive monsters are in hot pursuit.



SIMULATION



ADVENTURE

**'The pace of an adventure game is much slower, but good ones can and do occupy addicts for hours'**

Hotshoe is a Q-Bert game except that the blocks are atomic piles radiating nuclear energy. Jumping on the piles reduces this energy, although Ron Robot and mutant atoms do their best to sabotage the players efforts.

Ever considered yourself to be an inventive, imaginative, intelligent bold explorer, but couldn't be bothered to go out the front door and prove it? Then adventure games could be the answer to these burning exploratory ambitions — you don't even have to move from the armchair!

Adventure games invariably involve a quest — finding the golden ring, rescuing the treasure from the Dragon's lair or liberating the magic sword. The player is presented with a description of the location he is in — where it is, what's in it, either in text or graphic format. Text/graphic adventures have both.

In any situation the player has to type into the computer keyboard what he wants to do. For instance 'go West', 'take sword' or perhaps 'kill dwarf'. Whatever action the player takes usually changes the location or situation.

Imagination, lateral thinking and luck are the essential qualities needed because the situations the player finds himself in are often obscure.

## Problems

In the advanced adventures, game characters each have their own personalities and react differently according to the circumstances you find them in.

It should also be possible to solve the problems you encounter in several different ways.

The pace of an adventure game is much slower than that of the arcades, but good ones can and do occupy addicts for hours.

Level Nine, specialists in sophisticated, exciting brain taxing Adventures, have converted a number of their text-only adventures including Colossal Adventure, Adventure Quest, Lords of Time, Dungeon Adventure and Snowball to the MSX. The Hobbit is another classic for MSX.

A strategy game needs neither rapid reflexes nor imagination. An ability to think logically is the essential requirement. In other words the player needs brains!

In a typical strategy game the player assumes a role, for instance a political candidate, an army commander or ruler of the country and is presented with information in the form of charts, maps, diagrams and statistics. From these, the player assesses the position he finds himself in and makes decisions on what to do next. Special Operations and Holdfast are typical strategy games.

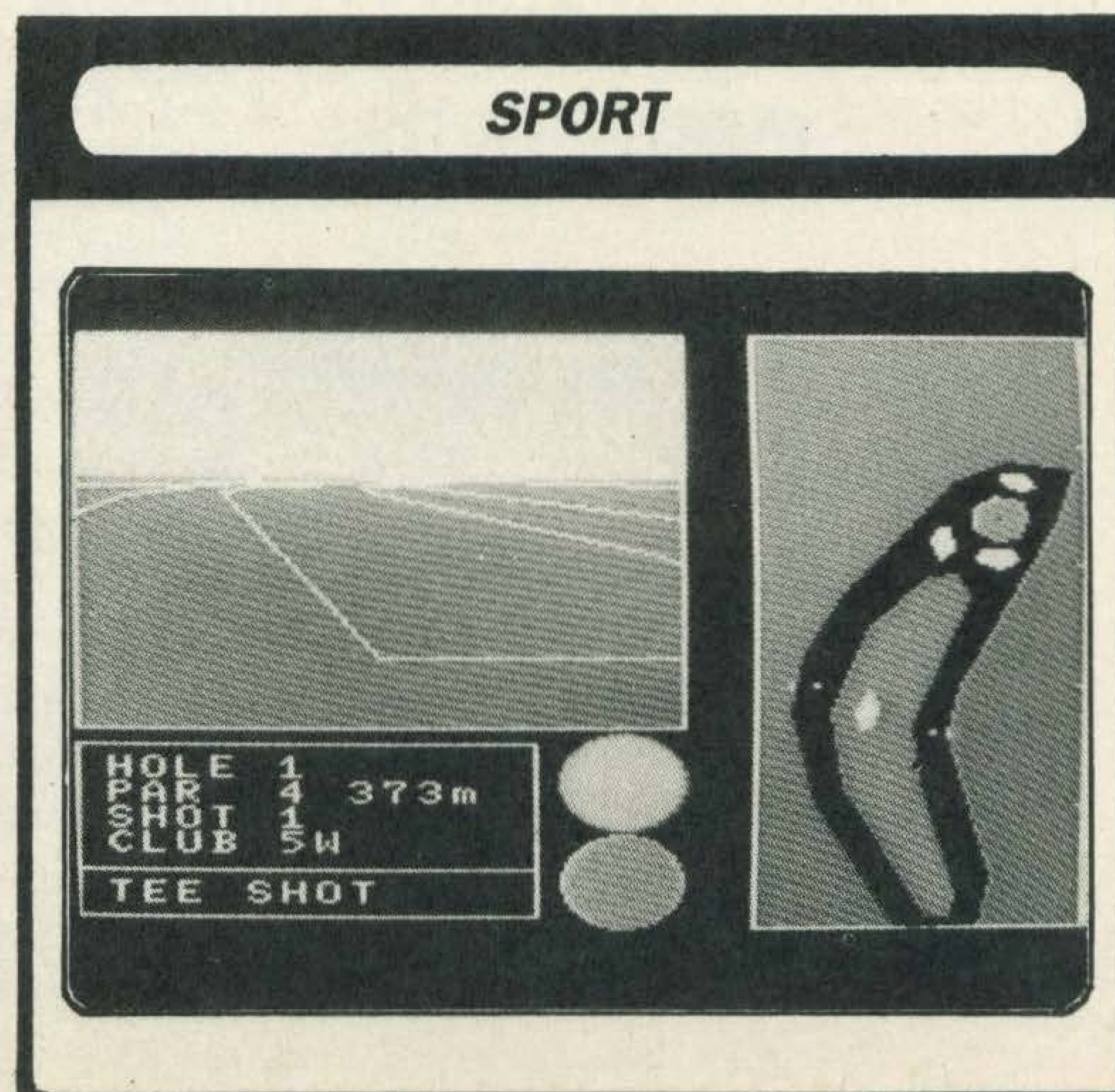
**'A strategy game needs neither rapid reflexes nor imagination. An ability to think logically is essential'**

Cubit, a sort of three-dimensional noughts and crosses and Supermind, a version of Mastermind are less complicated types of strategy games.

Hoyle's Rules of Games, an authority on games, lists all the games falling into the traditional category. All the board, card and pub games fall under this category and the player



PUB GAME



SPORT

can usually play either against the computer or against another opponent.

With board games such as Chess, Backgammon and Othello, the board appears on screen and the player can either use the keyboard or a joystick to make moves. The computer takes its turn and very rarely makes mistakes!

Computerised card games include Cribbage and Bridge. In these the player's hand is displayed on screen.

**'Sporting enthusiasts who prefer to enjoy sport on the TV will welcome the sport simulation games'**

Pub games include all the games traditionally associated with pubs. Computer Billiards and Hustler are both computerised versions of Pool. Pinball games such as Rollerball and Pinball are available for the MSX. With Rollerball the screen scrolls downwards as the ball passes down the board and the flippers are controlled with two of the keys. Flashing lights and suitable sounds accompany the ball action.

Making a subject fun is the best way to teach children and much of the educational software, especially the programs for the younger age range use games to teach subjects like spelling and mathematics.

Monkey Academy is an excellent example. A series of platforms hanging with fruit and blinds concealing numbers confronts the player. The level of difficulty dictates how complicated the sum is. To answer it the player guides the monkey up and down the platforms avoiding the purple crab and pulling blinds down until the answer is reached.

Much of the educational software uses arcade game ideas. Examples include Word Wobbler, 3D Hypermaths, Number Painter and BMX Number Jump.

Sporting enthusiasts who prefer to enjoy sport on the TV rather than — perish the thought — going out and actually playing themselves, will welcome the sports simulation games. Athletic events such as cricket, golf, football can be played with minimal effort. In fact twiddling the joystick or tapping the keys are the only strenuous activities involved.

Ping pong was the very first sports simulation game, but graphic and sound technology has moved fast and the games have become increasingly sophisticated and much more fun to play.

Hyper Olympics features four athletic events, the 100 and 400 metres, long jump and the hammer throwing. Hyper Sports involves trampolines, the horse, gymnastics, diving and the horizontal bars. A joystick can be used, but waggling the stick from side to side in the 400 metres can be extremely tiring. To make the games more realistic you have to qualify in one event before you are allowed to proceed to the next one.

**'As programmers and software companies become more experienced, new games appear'**

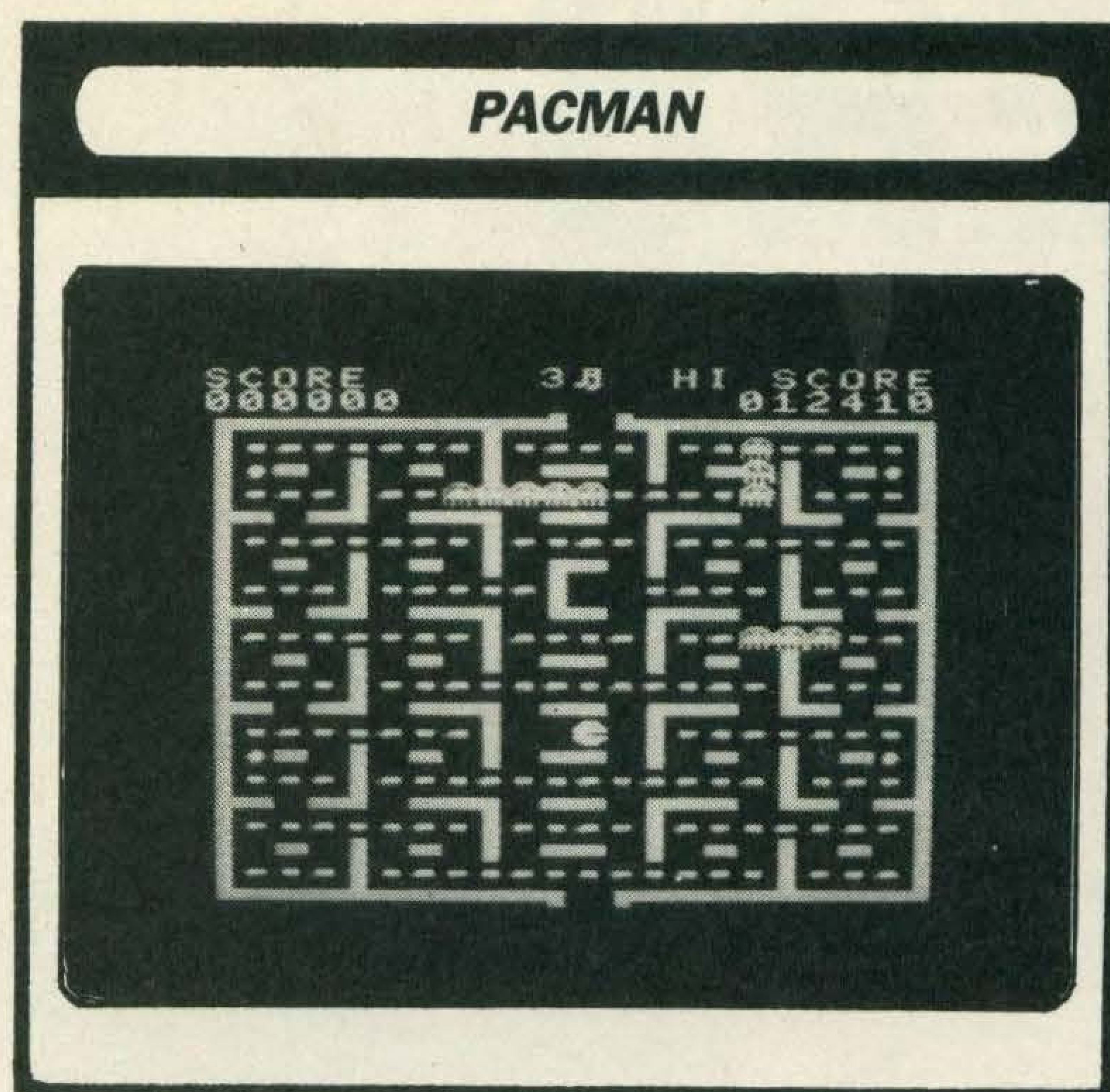
There are also golf simulation games — Golf and 3D Golf Simulation. Tennis is an excellent version of computer tennis. Football and cricket games are available for other computers so it will only be a matter of time before they appear as MSX versions.

Flying and landing a huge Jumbo jet safely on the ground must be a thrilling experience which few people ever experience, but with the flight simulator programs, the complications and techniques of the process are emulated.

Using an instrument panel filled with all the gadgets that a professional pilot would use, the player has to fly an imaginary plane and touch down on a runway — without ploughing three miles into the ground as we usually find ourselves doing!

Aircraft speed, altitude, flap extensions, crosswinds, wind velocity, air temperature all have to be taken into consideration. Various difficulty levels are usually provided. 737 Flight Simulation is an excellent example of a Flight Simulator.

As programmers and software companies become more experienced, new game types constantly appear on the market. A successful, totally original game is a rare bird and indeed is guaranteed to spawn a host of imitators. Still the imagination of games designers seems far from exhausted yet.

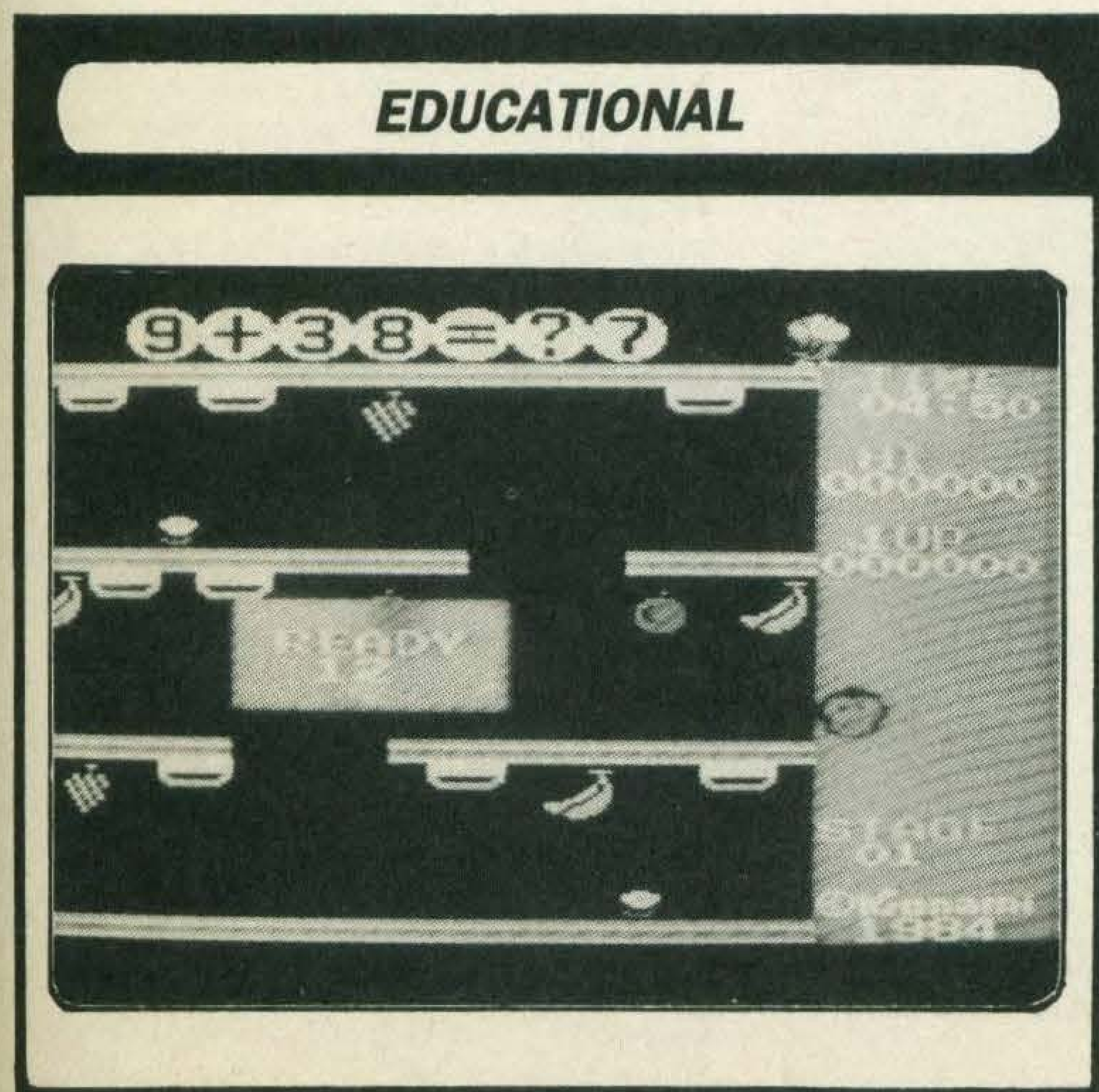


PACMAN

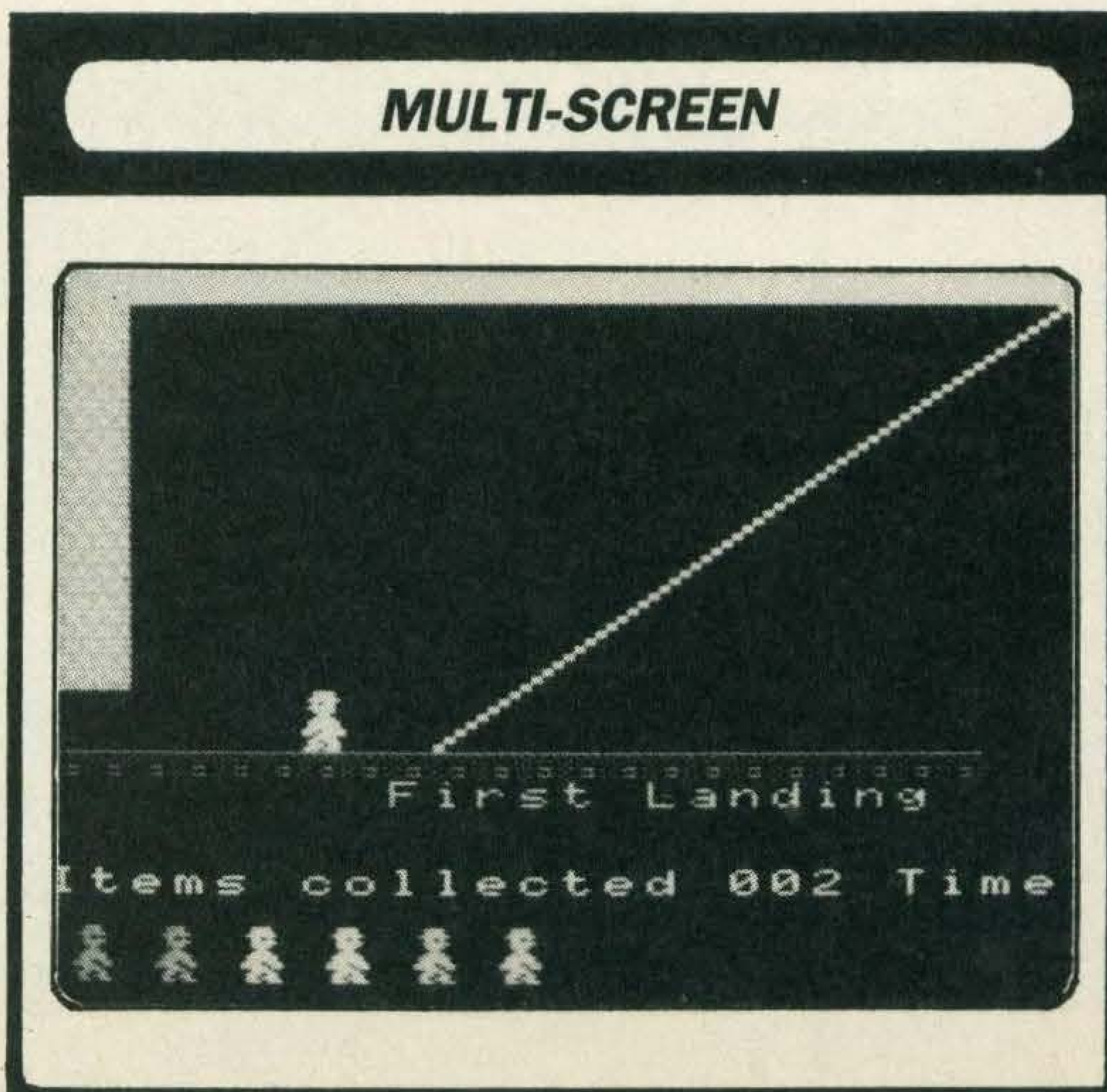
SCRAMBLE

## Verdict

**MSX software is increasing in quantity and quality every month. Many games are being converted from other computers, so there should be something for every taste. Whatever type of game you prefer, there will be a wide choice. Finding out game preferences will take time, but it is worth doing if you are to avoid wasting money on games you won't like. Check out the software guide at the back of this issue to see what's available. We've sure come a long way from ping pong.**



EDUCATIONAL



MULTI-SCREEN

# SUPPLIERS

**These are the names, addresses and telephone numbers of the major MSX software suppliers.**

**A&F Software**
Unit 8
Canalside Industrial Estate
Woodbine Street East
Rochdale
Lancs
(0706) 341111

**Activision (UK) Inc.**
15 Harley House
Marylebone Rd
London NW1
01-486 7588

**Alligata Software Ltd**
1 Orange Street
Sheffield
S1 4DW
(0742) 755796

**Ampalsoft**
PO Box 19
Knutsford
Cheshire
WA16 0HE
(0565) 893563

**Anirog Software**
29 West Hill
Dartford
Kent
(0322) 92513

**Artic Computing Ltd**
Main Street
Brandesburton
Driffield
Nth. Humberside
YO25 8RL
(0401) 435533

**ASK**
London House
68 Upper Richmond Road
London
SW15 2RP
01-874 6046

**Bubble Bus Software**
87 High Street
Tonbridge
Kent
TN9 1RX
(0732) 355962

**CDS**
Silver House
Silver Street
Doncaster
DN1 1HL
(0302) 21134

**Computer Mates Ltd**
PO Box 2
Houghton Down
Stockbridge
Hampshire SO20 6LE
(0264) 810824

**CRL**
9 Kings Yard
Carpenter's Rd
London
E15 2HD
01-533 2918

**Electric Software Ltd**
8 Green Street
Willingham
Cambridge
CB4 5JA
(0954) 81991

**Hisoft**
180 High Street North
Dunstable
Beds
LU6 1AT
(0582) 696421

**Intelligent Software Ltd**
37 Bedford Square
London WC1 3HW
01-636 7017

**Kemp Ltd**
43 Muswell Hill
London
N10 3PN
01-444-5499

**Knights TV and Computers**
108 Rose Mount Place
Aberdeen
AB2 4YW
(0224) 630526

**Konami Ltd**
269 Field End Road
Eastcote
Middlesex
HA4 9LS
01-429 2446

**Kuma Computers Ltd**
Unit 12
Horseshoe Park
Horseshoe Road
Pangbourne
Berks RG8 7JW
(07357) 4335

**Level 9 Computing**
229 Hughenden Road
High Wycombe
Bucks
HP13 5PG
(0494) 26871

**Llamasoft Ltd**
49 Mount Pleasant
Tadley
Hants
RG26 6BN
(07356) 4478

**Longman Software**
Longman House
Burnt Mill
Harlow
Essex
CM20 2JE
(0279) 26721

**Mastertronic Ltd**
Park Lorne
111 Park Road
London NW8 7JL
01-935 4944

**M.C. Lothlorien**
56A Park Lane
Poynton
Cheshire
SK12 1AE
(0625) 876642

**Megacycal Software Ltd**
PO Box 6
Birkenhead
Merseyside
L43 6XH
051-652 3139

**Micro Aid**
25 Fore Street
Praze
Camborne
Cornwall
TR14 0JX
(0209) 831274

**Microcom**
67 Gestridge Road
Kingsteignton
Devon
TQ12 3HJ
(0626) 60473

**Mirrorsoft**
Mirror Group Newspapers
Holborn Circus
London
EC1P 1DQ
01-822 3971

**MPL**
Maple Walk
Bexhill
East Sussex
TN39 4SN
(04243) 5840

**Mr Micro Ltd**
69 Partington Lane
Swinton
Manchester
M27 3AL
061-728 2282

**Music Sales**
78-79 Newman St
London W1T 3LA
01-636 7777

**Ocean Software**
Ocean House
6 Central Street
Manchester
M25 5NS
(061) 832 6633

**The Office Junior**
Market Place
Oundle
Nr Peterborough
PE8 4BA
(0832) 72127

**Orpheus Software**
The Smithy
Unit 1
Church Farm
Hatley St George
Nr Sandy
Beds
SG19 3HP
(0767) 51481

**Panasonic (UK) Ltd**
300-318 Bath Road
Slough
Berks
SL1 6JB
(75) 34522

**PSS**
452 Stoney Stanton Road
Coventry
CV6 5DG
(0203) 667556

**Quicksilva Ltd**
Palmerston Park House
13 Palmerston Road
Southampton SO1 1LL
(0703) 20169

**Software Projects**
Bearbrand Complex
Allerton Road
Woolton
Liverpool
L25 7FS
(051) 428 9393

**Sony UK Ltd**
Sony House
South Street
Staines
Middlesex
TW18 4PF
(81) 61688

**Spectravideo Ltd**
165 Garth Road
Morden
Surrey
SM4 4LH
01-330 0101

**Tasman Software Ltd**
Springfield House
Hyde Terrace
Leeds
LS2 9LN
(0532) 438301

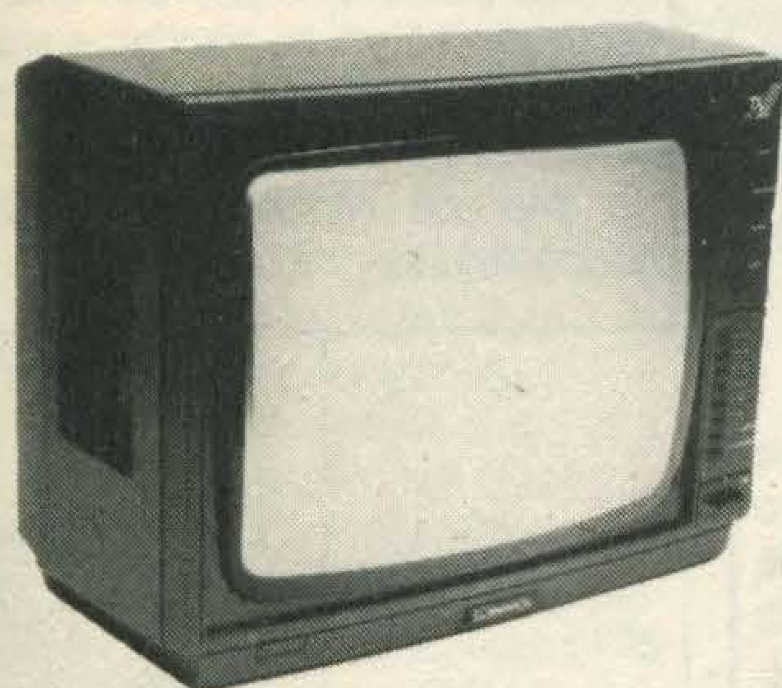
**Terminal Software**
Derby House
Derby Street
Bury
BL9 0NW
061-761 4321

**Toshiba (UK) Ltd**
Toshiba House
Frimley Road
Frimley
Camberley
Surrey
GU16 5JJ
(0276) 62222

**Virgin Games**
2-4 Vernon Yard
Portobello Road
London W11 2DX
01-727 8070

**Visions**
1 Felgate Mews
Studland Street
London
W6 9JT
01-748 7478

# What MSX?



## Over the next 16 pages you'll find all the information you need to build up a complete MSX system




Confused by computers? Puzzled by peripherals? Stonkered by software? Here are the answers — or at least the information that will get you on the right track. This is as comprehensive a guide as has been humanly possible to compile to the MSX computer scene. It details machines, peripherals and programs that are, or are due to be, available.

It is divided into six sections, over the next 16 pages.

We kick off with a diagramatic overview of an MSX computer system — what plugs into what, what different things to do and so forth. Be warned, there's no such thing as a complete system. You'll be bankrupt before you get anywhere near buying all the things that you can use with your MSX computer.

The first main listing is a comparative chart of all currently available MSX computers. Many are reviewed in this issue of What MSX? The comparative table shows how they stack up against each other for price, features and so forth. You should be able to compile a shortlist if you haven't already settled on a favourite machine.

The next listing is of MSX peripherals. These are the pieces designed exclusively for MSX computers. You'll find details of disk drives, light pens, speech synthesisers, touch pads, communications hardware and much more.

If you're a games player, you must consult the buyers' guide to joysticks. Here you'll find details of all kinds of joysticks, including paddles, remote control units, trackballs and so forth. The aliens will never stand a chance!

To improve the quality of your image, consult the buyers' guide to monitors. We've the facts on just about every monitor costing less than £500. If you think that your games look good on the domestic television, wait till you see what a monitor does to them. We've got a full explanation of the terms you'll meet in the monitor world too.





For hard print, the buyers' guide to printers has all the hard facts. Over 100 printers are listed, costing up to £1,000 or so. Some are super fast, others offer super quality. Some do colour, some run silently. Some can be used as an electronic typewriter, others as viewdata terminals. There's a tremendous variety of printers to choose from, and this guide should put you on the right path.

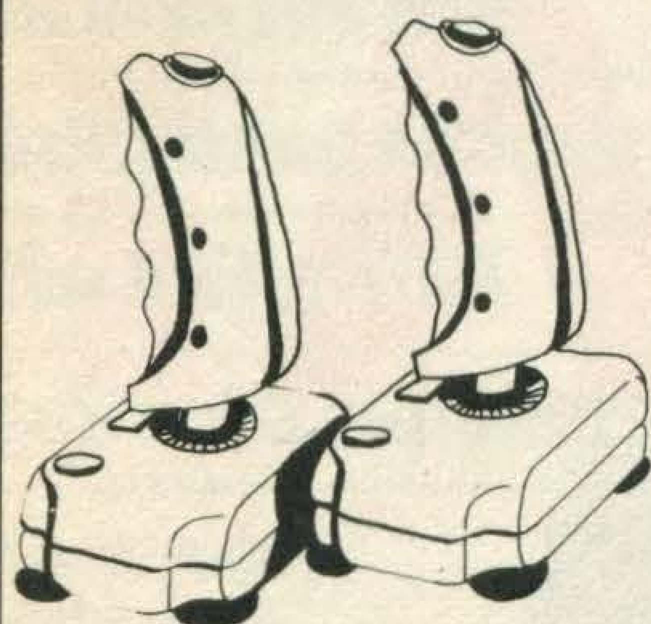
The last section of the Buyers' Guide lists MSX soft ware. Some of it may not be available immediately, but is promised for the near future.

As there are so many software packages available, we've grouped them into categories. These are games, education, business, utility and other. We've listed the supplier of each package, and you'll find addresses and 'phone numbers of suppliers. Some of the software may not be available through your local MSX dealer, so you may have to order direct.

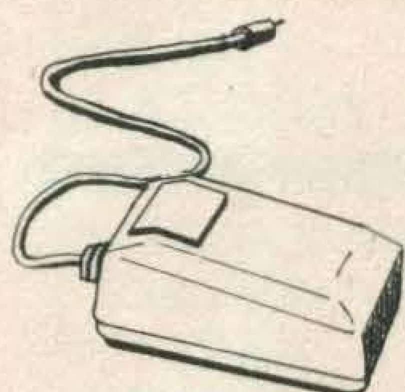
Prices throughout are approximate only. Peripherals may be discounted, particularly if they are popular and widely available. Computer prices can vary from shop to shop too. Check out advertised prices.

With the huge amount of MSX hard and software arriving on the market, we're sure you'll find just what you are looking for to make your MSX system do what you want it to.

# TALKING COMPUTERS



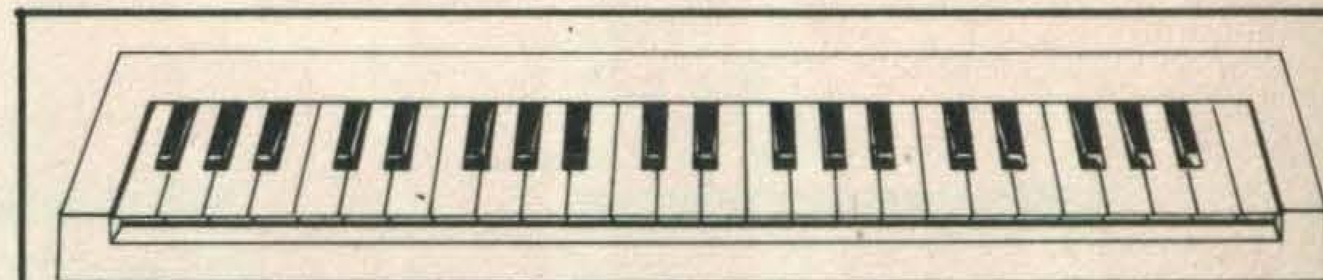
**JOYSTICK**
The most popular games controller, the joystick has one of two fire buttons and relays the player's movements to the computer. Some joysticks are available with continuous fire buttons for the cheats among us!

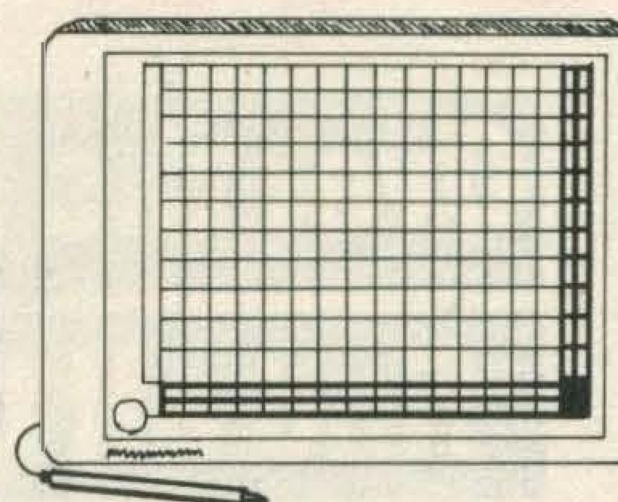


**MOUSE**
An alternative way to control the screen cursor. Works rather like a 'rolling joystick', the mouse's movements over your desk top are mimicked by the cursor on the screen. Good for building graphics.



**LIGHTPEN**
The light sensitive element at the end of a light pen sends signals to the computer via a modulator which interfaces through the cartridge port. Lightpens can be used for educational games, graphics or any program which involves selecting from lists (menu driven).

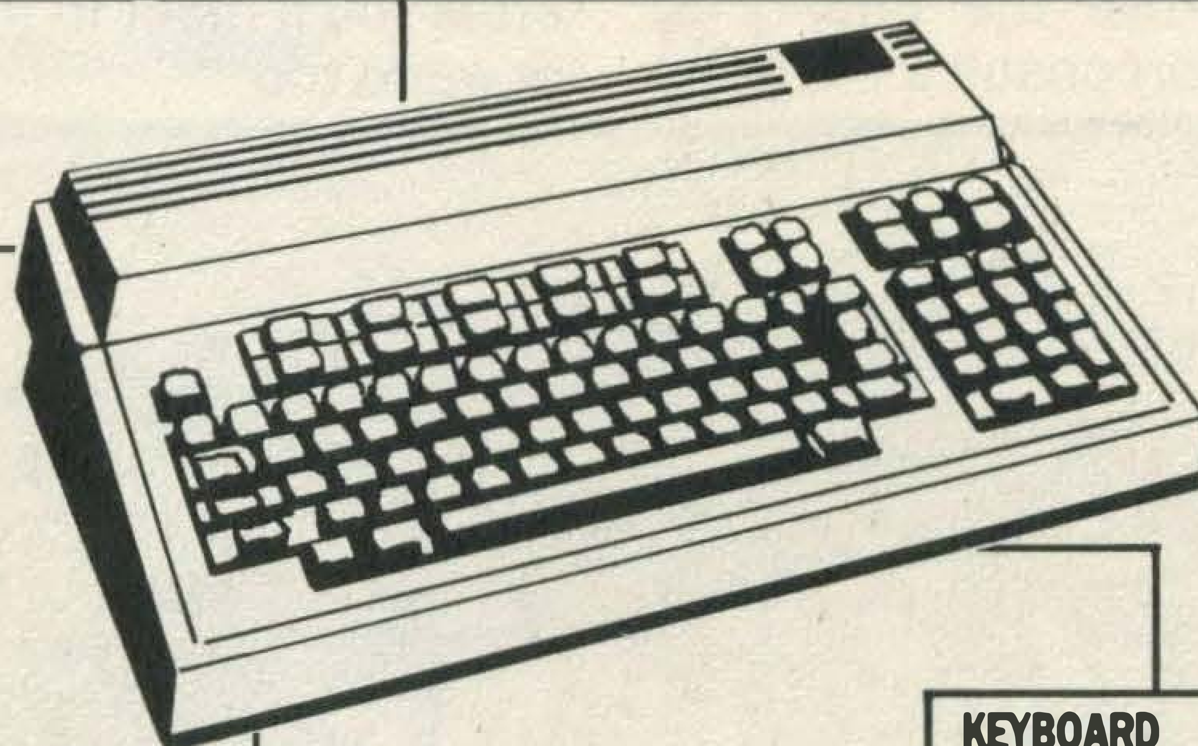




**GRAPHICS TABLET**
The computer equivalent of the Etch-A-Sketch! The stylus is used to draw lines on the tablet proper while the palette is used to choose colours and hatch patterns for outline filling.

**MUSIC KEYBOARD**
To enable computers to have quick access to music without the problems of coding or notation some manufacturers are producing 2½ or 4 octave keyboards which will plug in to interface cards for the MSX expansion bus.

**INTERFACES**
The 50pin input/output socket (**expansion bus**) on the MSX computer offers expansion possibilities through the use of dedicated plug-in modules. Called 'cards' these circuits can either expand the operation of the micro (an 80 column card for word processing or a data cartridge) or enable the computer to be interfaced with specialised input devices, light pens, music keyboards etc.



**LANGUAGES**
**Computer languages** are coded instructions. There is a wide variety of languages available each with its own application. MSX BASIC spoken here!

**High level** languages are computer languages easily understood by you and I but not by the processor.

**Low-level** languages (like Machine Code) are much closer to the language of the processor but are difficult to read by humans and hard to edit. The benefit of programming in a low level language is the higher speed at which it runs.

**BASIC.** This stands for Beginners' All-purpose Symbolic Instruction Code. Though developed as an introductory language it has now become one of the most widely used languages for home computing. Various dialects exist.

**MSX BASIC.** This is the extended version of BASIC written by the MicroSoft Corporation as used on all MSX computers.

**ASSEMBLERS etc**
**Assembler.** Correctly called assembly language, this exists between the high level programming language and Machine Code which it generates. Assembler carries over some of the benefits of a high level language (labels etc) yet is fast to run.

**Compiler.** This is a program which translates your program into Machine Code — permanently. Compiled programs are quick to run but very hard to edit.

**Interpreter.** Unlike the compiler, an interpreter translates your program into Machine Code one line at a time. This makes programs slower to run but relatively easy to edit.

**CPU**
The **Central Processor Unit** is simply a vast array of electronic switches which can either be on or off. These two states are represented by binary (base two) notation; there are two binary digits (**bits**), namely 0 and 1.

**Machine Code.** This is the language of the processor. This is called a low-level language because it is removed from the quasi-English of a high-level language like BASIC.

**KEYBOARD**
The Keyboard is the traditional interface between humans and the computer. The standard QWERTY layout is supplemented by some special keys on the MSX keyboard. The **function keys** marked F1-F10 allow complex commands to be entered at one key stroke.
Four **cursor keys** are used to move the cursor up, down and across the screen. Some games programs can be played with just the cursor keys and require no joystick control.

A **GRAPH** (Graphics) key allows the QWERTY keyboard to enter symbols with one key stroke. The GRAPH key works like the SHIFT key.

The full 73 key set is made up with four keys which allow insertion and deletion, one which returns the cursor to the top left of the cleared screen and one, SELECT, which is of use in WP and data entry programs but has no use in BASIC.

**MEMORY**
**RAM** (Random Access Memory) the amount of memory quoted in K (Kilobyte).

**ROM** (Read Only Memory) this is the memory 'set up' by the manufacturer. MSX Basic language is stored here. Like RAM this is quoted in K.

**Byte.** Memory is determined by the number of characters which can be stored. A character is coded by an 8 bit binary word which is called a byte.

**Kilobyte.** As computer mathematics are binary (to the base of 2) the nearest binary number to 1000 is 1024. 1024 Bytes make one Kilobyte. Megabyte and Gigabyte are terms for even larger numbers of bytes.

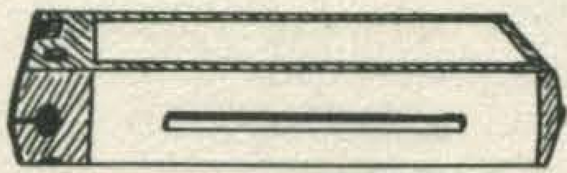
**User RAM.** Computers tend to use a lot of RAM when asked to generate high resolution graphics, to run other languages or specialised peripherals. User RAM is what's left over for your programming.

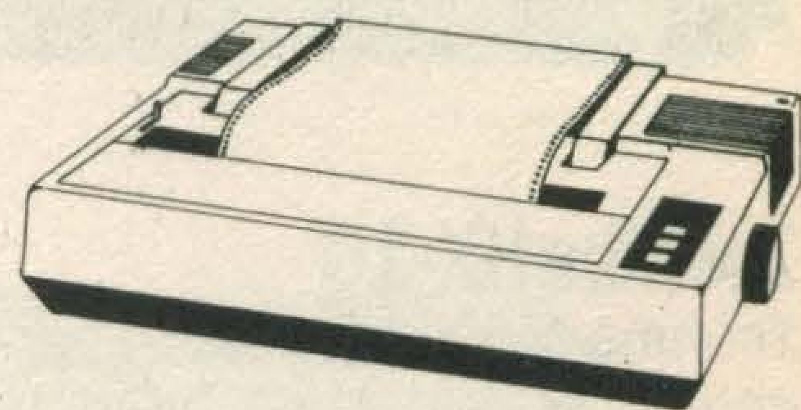
**GENERAL**
**Software** is the general term for computer programs. **Hardware** is everything else, the processor, keyboard etc. **Firmware** is software stored in a 'hard' form, cartridges and ROM chips are good examples.

**Peripherals.** The bolt-on goodies. This term covers, printers, plotters, joysticks, monitors and the like.

**VDUs.** A general term for a visual output; stands for Visual Display Unit and covers monitors, and TVs.

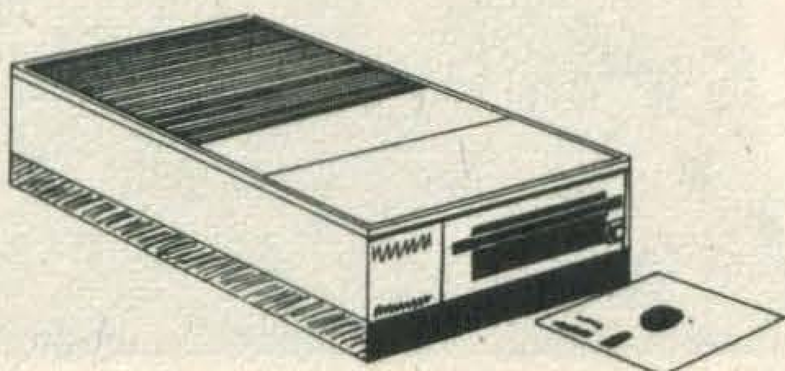
**CARTRIDGE**
The quickest way to load a program, but as yet the most expensive. Programs are permanently stored on a micro chip in the cartridge case which interfaces through a 50 pin cartridge socket.

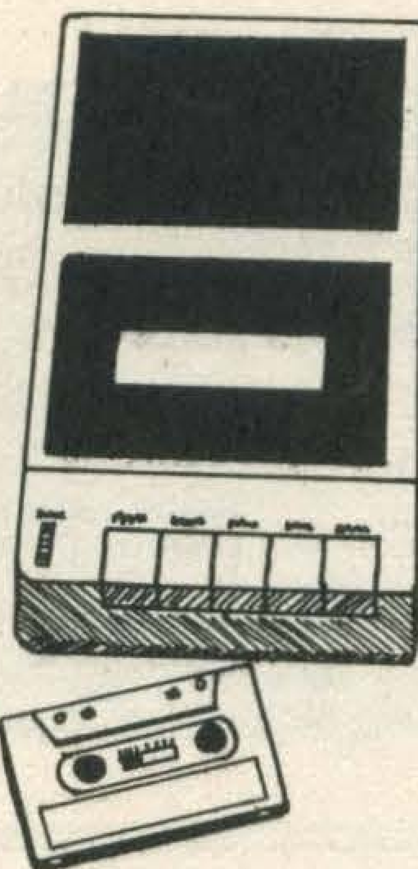




**DATA STORAGE AND RETRIEVAL**
**Disks** and **Compact Cassettes** are the most common forms of permanent data storage. Both are magnetic record/erase devices. Disks offer faster access to a greater amount of stored information. Cassettes are slow but cheap.

Disks are divided up into tracks and sectors. The computer needs to know where data has been stored; this 'housekeeping' function is run by a program called the Disk Operating System (**DOS**). The **MSX-DOS** (Micro-Soft Extended Disk Operating System) is used by MSX machines. **CP/M DOS** (Control Program for Micros) is data compatible.





**PRINTERS AND PLOTTERS**
**Dot matrix** printers build up the patterns of letters and characters by a bank of pins striking through an inked ribbon. Print quality varies from terrible to good.

**Daisywheel** printers are named after the spinning disc which carries the type elements on its spokes. The very highest print quality can be achieved but speed and character set is often limited.

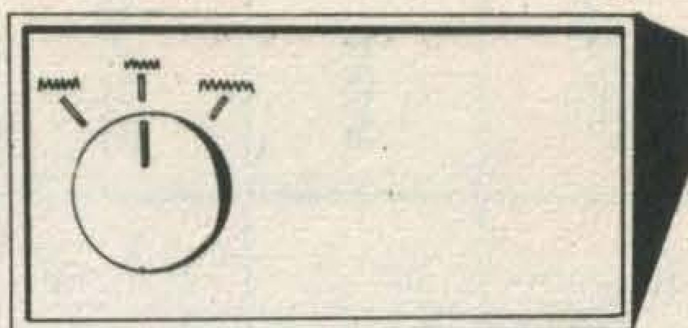
**Plotters.** These draw graphs and diagrams with a pen and can be either of the flat bed or platen type. A choice of pen colour is often offered.

**Thermal printers.** These offer fast, quiet but limited quality print often on especially treated paper which reacts with heat to show visible lettering. Material costs and print quality are often a deciding factor against such printers.

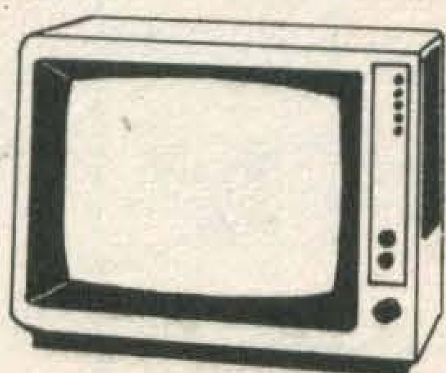
**DATA TRANSMISSION**
Computers can be networked to enable one user to talk to others individually or together through 'electronic mailboxes'. The telephone system can be used via special adapters to let one computer talk to others.

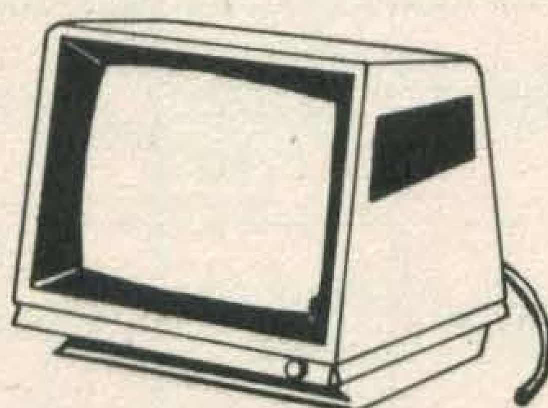
**Modem** stands for Modulator/Demodulator, a Modem turns the telephone system into a giant cable between distant computers. The Modem is a 'black box' which converts the low voltage digital signals from the computer into an analogue signal which can be transmitted over the 'phone system.

An **Acoustic Coupler** is a more portable and often cheaper way of interfacing a computer with the 'phone network'. Here the computer output is used through a modulator or to drive a telephone handset through a microphone and loudspeaker. Portable couplers offer the businessman instant access to his data base back at the office.

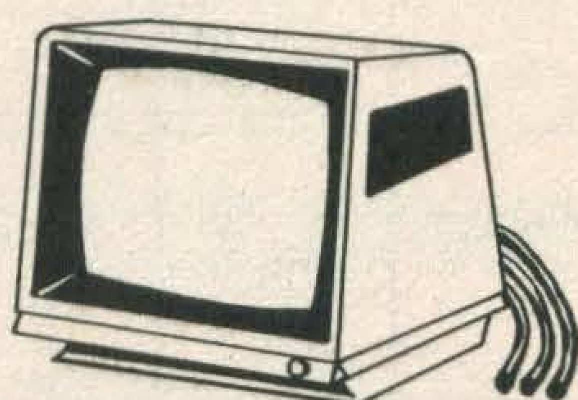


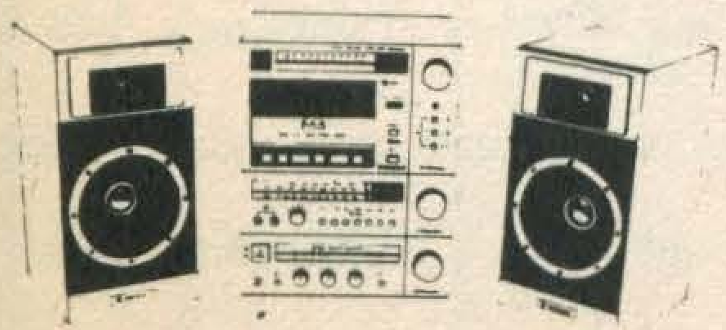






**AUDIO AND VIDEO**





**GETTING A PICTURE**
All MSX computers will give sound and pictures from a standard **TV** set through their UHF output. A dedicated **monitor** will give better resolution from the video output while the audio output can be taken to a hi-fi system if the monitor has no built in loudspeaker. **RGB** outputs allow individual control over the Red, Green and Blue electron guns in the monitor colour and can be used to produce high quality graphic images.

**SOUND**
Computers have conventional audio outputs which can be used to drive the tape or tuner input of any hi-fi system. MSX computers have three separate channels of sound, and a fourth channel of noise. Stereo outputs are possible. A computer can be used to define the precise waveform of a sound just in the manner of a synthesiser.

**TEXT**
Computers are frequently used for **word processing**, to write letters or reports. Most text displays give 37 characters (or 40) by 24 lines. Real word processor packages reform the text screen to 80 characters (some to 64 characters wide). Powerful editing facilities enable the user to delete and insert words, phrases or paragraphs, to search for and correct spelling. Dictionary programs can also be bought.

**GRAPHICS**
The smallest unit of 'graphic information' is the **pixel**. This can be thought of as the dot from which graphics can be built up. The MSX system uses a screen of 49152 pixels arranged in 256 columns of 192 lines.

**Sprites** are independently programmable groupings of pixels which form a recognisable character which can be 'addressed' around the screen.

**16 colours** are available to the programmer working in MSX.




## Toshiba HX-10 £239

Toshiba was the first Japanese maker to bring out an MSX computer and have been the most active in promoting the standard. The HX-10 is a mid-priced unit, currently supplied with a package of software and widely available through major multiples. It is a 64K machine with the usual range of interfaces, though there is only one true cartridge port.

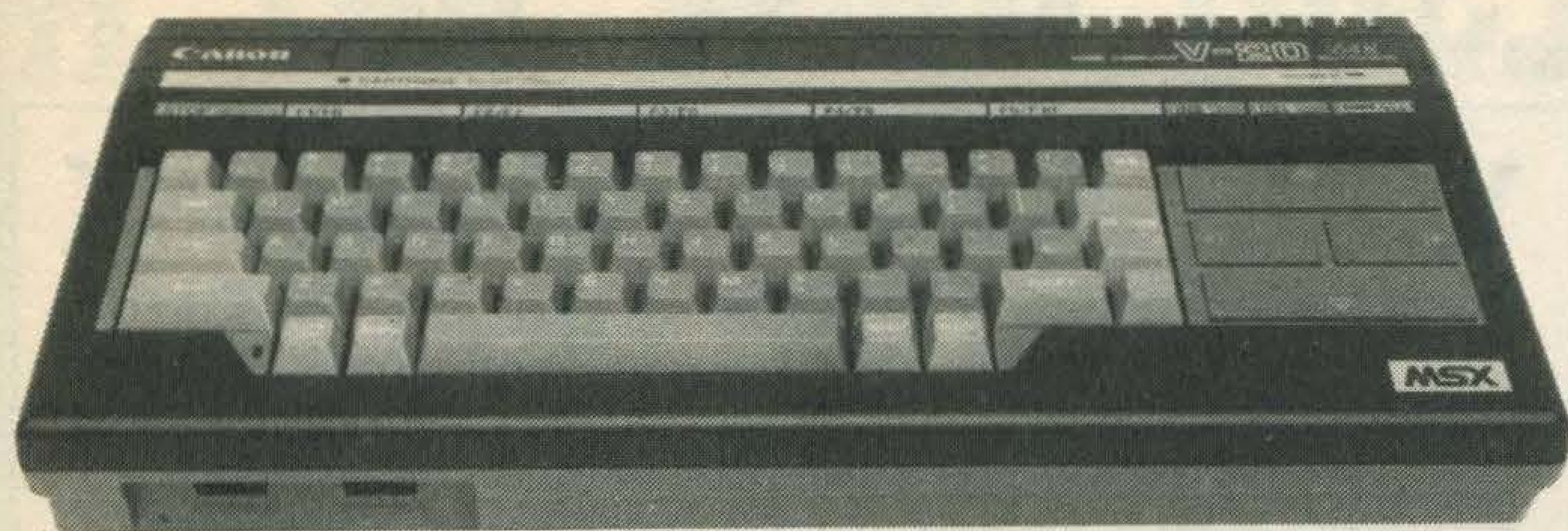
Toshiba's peripherals include a joystick, an RS232-C adaptor, a dot matrix printer, a printer plotter and the usual array of data recorders and monitors. They are also importing a range of software on cassette.

## Sanyo MPC-100 £299

Sanyo's MPC-100 is at the top end of the MSX price scale. Quality is one of the Sanyo's best attributes. It is solidly made and will take a beating. There is 64K of RAM and a full range of interfaces. A light pen holder highlights that particular Sanyo peripheral — a light pen for the creation of graphics on the screen. Sanyo also have a joystick, data recorder and a monitor among their add-ons. But it is the quality of the computer that is the main attraction.




| COMPUTER | | | MEMORY | | | KEYBOARD | | | | DISPLAY | | INTERFACES | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maker | Model | Price | Total RAM | User RAM | ROM Contents | Type | Numeric Keypad | Cursor | Output | Text format | Joysticks | Expansion bus | Cartridge port | Printer | Serial port | Cassette |
| Canon | V-20 | £280 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | — | 2 | Centronics | — | DIN |
| Goldstar | FC-20 | £199 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| JVC | HC-7 | £279 | 80K | 64K | 32K Microsoft MSX BASIC | 72 key, full stroke | No | Keypad | RF, CV, RGB | 40×24 | 2 | — | 2 | Centronics | — | DIN |
| Mitsubishi | ML-F48 | £225 | 48K | 32K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| Mitsubishi | ML-F80 | £275 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| Panasonic | CF2700 | £280 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | — | 2 | Centronics | — | DIN |
| Sanyo | MCP-100 | £299 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| Sony | HB-75 | £299 | 80K | 64K | 32K Microsoft MSX BASIC Sony Firmware | 75 key, full stroke | No | Keypad | RF, CV, RGB | 40×24 | 2 | — | 2 | Centronics | — | DIN |
| Spectra-video | SVI-728 | £250 | 80K | 64K | 32K Microsoft MSX BASIC | 90 key, full stroke | Yes | Keys | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| Toshiba | HX-10 | £239 | 80K | 64K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |
| Yamaha | CX5M | £534 | 48K | 32K | 32K Microsoft MSX BASIC | 73 key, full stroke | No | Keypad | RF, CV | 40×24 | 2 | Yes | 1 | Centronics | — | DIN |




## Canon V-20 £280

Canon are perhaps better known for their cameras and copiers. This is their only MSX micro and it conforms to standard 64K specifications. The attention-grabbing feature is the extra large cursor keypad that is excellent for games playing. There are two joystick ports too, and the price is a little lower than the top range MSX rivals.

Canon's peripherals are limited to a joystick, though they do make non-MSX printers. They are keeping a low profile in the market, with machines available mainly through Comet and Spectrum shops. The V-20 has few distinctive features, but does all a 64K MSX micro should.

## JVC HC-7 £279

JVC are big in the audio and video fields. In the computer field, they are playing things cool. The HC-7 is a standard 64K MSX machine, blessed with excellent styling and quality throughout.

There are no special features, though JVC do have plans for an interface with video disc. They currently have a joystick and a number of data recorders available. It is a case of watch this space for other peripherals.

The JVC has a middling price and if looks mean anything, it is an attractive machine. It offers nothing that other 64K machines don't have, other than style.




| SOUND | | | OTHER | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reset button | Built-in storage | Power supply | Software supplied | Accessories supplied | Distributor | Availability | Reviewed | Comments |
| No | No | Built-in | None | M(2), C, RF | Canon (UK) Ltd, Canon House, 2 Manor Rd, Wallington, Surrey SM6 0AJ | Comet Spectrum | Nov '84 | Canon's effort isn't a world beater, but it does a more than adequate job |
| No | No | Built-in | Demo, 1 game | M(2), C, RF | Microdealer (UK) Ltd, 29 Burrowfields, Welwyn Garden City, Herts AL7 4SS | 600 | Mar '85 | The emphasis is on value for money and durability |
| Yes | No | Built-in | 1 utility, 1 game | M, C, RF | JVC, JVC House, 12 PriestleyWay, Eldon Wall Trading Estate, Staples Corner, London NW2 | G | Nov '84 | JVC offer style and support plus a 'branded' expansion into music and video accessories |
| No | No | Built-in | Demo, 6 games | M, C, RF | Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD | G | Mar '85 | Plenty going for it and excellent value for money to boot |
| No | No | Built-in | Demo, 6 games | M, C, RF | Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD | G | Nov '84 | Those after a reliable, solid MSX computer won't go far wrong |
| No | No | Built-in | None | M, C, T(3) | Panasonic UK Ltd, 300-318 Bath Rd, Slough, Berks SL1 6SB | G | Mar '85 | The style of the Panasonic does make it stand out from the crowd |
| Yes | No | Built-in | Demo, 3 games | M(2), C, RF | Sanyo Marubeni (UK) Ltd, Sanyo House, 8 Greycaine Rd, North Watford, Herts WD2 4UQ | G | Nov '84 | The Sanyo is one of the best MSX machines in terms of quality |
| Yes | No | Built-in | 3 utilities (built-in) | M(2), C, RF | Sony UK Ltd, Sony House, South St, Staines, Middx TW18 4PF | G | Nov '84 | The Sony HB-75 shows what the MSX standard could be all about |
| No | No | External | None | M, C, RF, Transformer | Spectravideo Ltd, 165 Garth Rd, Morden, Surrey SM4 4LH | G | Nov '84 | It is more a business than a games machine |
| No | No | Built-in | Demo, 3 games | M(2), C, RF | Toshiba Ltd, Toshiba House, Frimley Rd, Frimley, Camberley, Surrey | G | Nov '84 | One of the first and most numerous of the MSX machines |
| No | No | External | Voicing prog | YK-01 keyboard, M, C, RF | Kemble-Yamaha Music (UK) Ltd, Mount Ave, Bletchley, Milton Keynes MK1 1JE | 50+ | Mar '85 | As a synthesizer for the home, it is a super instrument |

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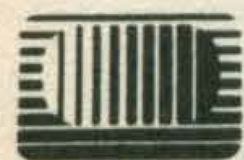

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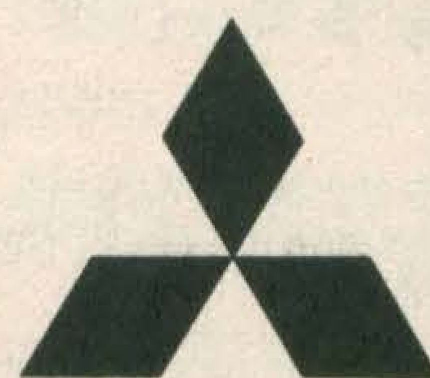

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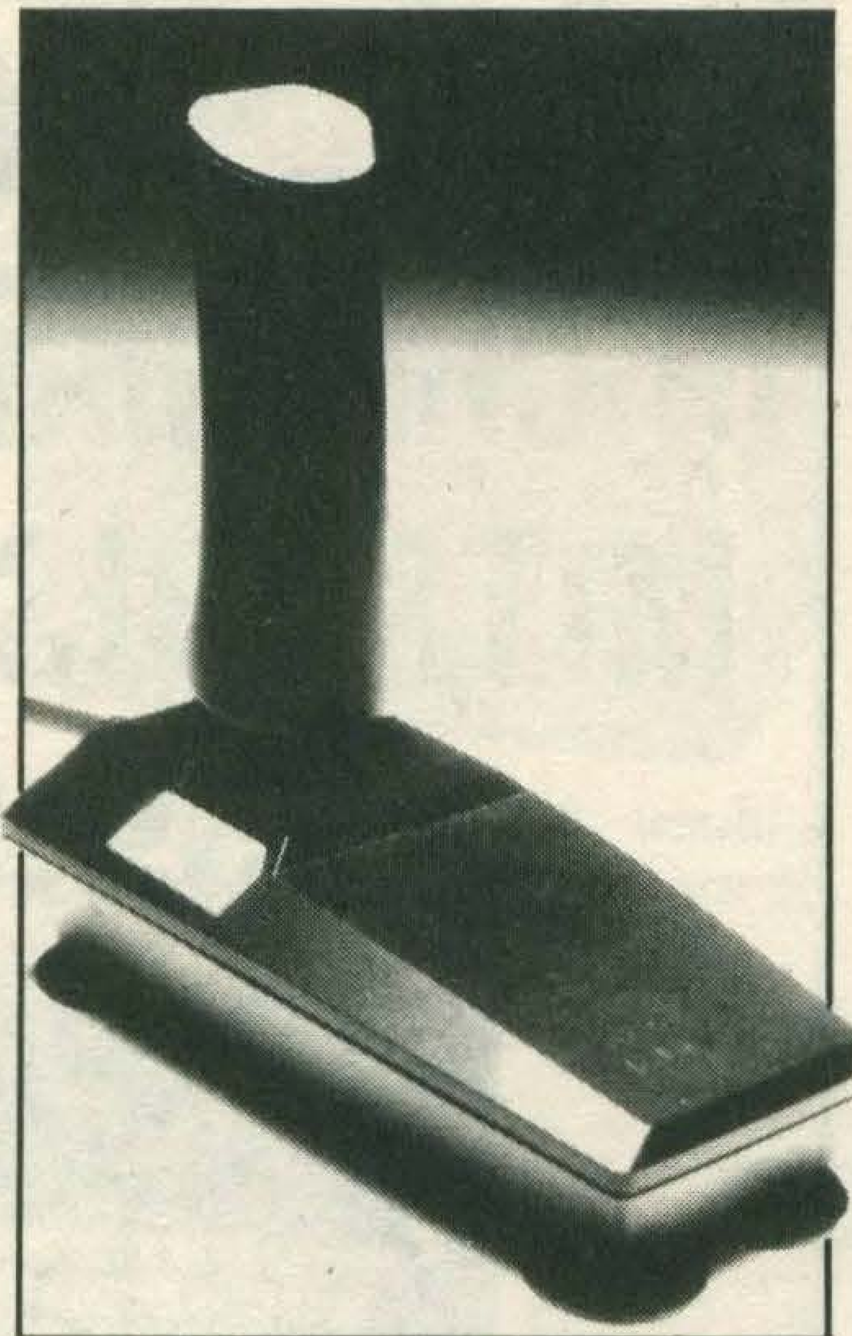
# MITSUBISHI MSX COMPUTERS

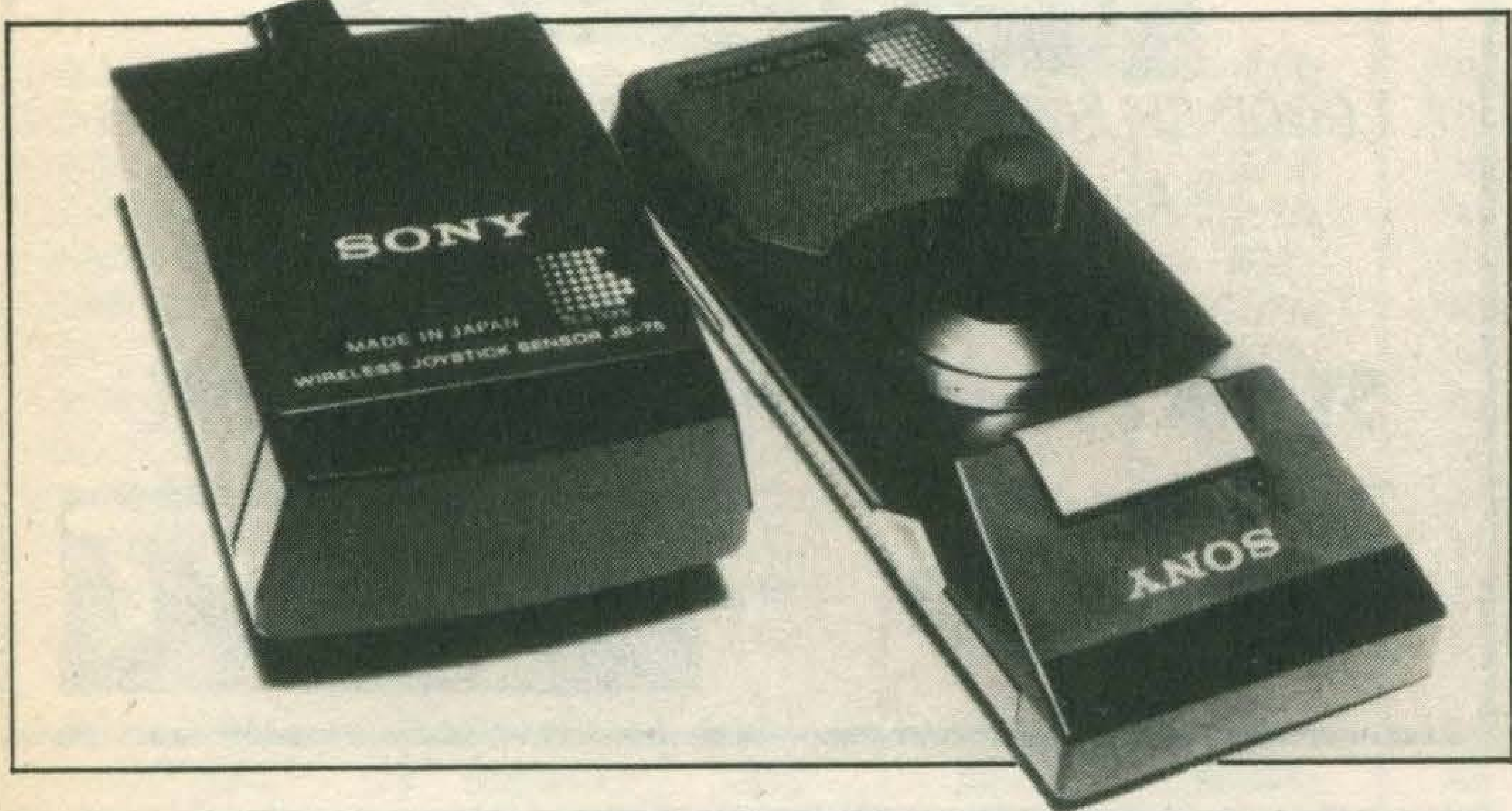
Whether you're attacking mutant hordes or rescuing maidens in distress you'll find a joystick invaluable.

For two player games, a pair is essential. There's a huge choice.

Our guide sets out the important facts about MSX-compatible joysticks and will help you make sense of the variety of models available.

For each joystick we've listed the number of fire buttons, whether it has a fast fire facility, the number of firing directions controls, the type of feet, if any, the cord length, the supplier and of course the price.






| Model | Number of Fire Buttons | Firing Directions | Fast Fire | Feet | Length of Cord | Price | Supplier |
|---|---|---|---|---|---|---|---|
| Atari CX-40 | 1 | 8 way | No | Rubber feet | 120cm | £7.99 | Atari International (0753) 33344 |
| Atari CX-24 Super-Controller | 2 | 8 way | No | None | 100cm | £9.99 | Atari International |
| Atari Trak-Ball CX-80 | n/a | Infinite | Yes | Rubber feet | 100cm | £19.99 | Atari International |
| Canon VJ200 | 2 | 8 way | No | Suction cups | 120cm | £15.00 | Canon (UK) Ltd 01-773 3173 |
| Competition Pro 1000 | 1 | 8 way | No | Rubber feet | 150cm | £8.95 | Kempston Micro Electronics |
| Computer Command | 2 | 8 way | Yes | Rubber feet | 150cm | £27.95 | CGL |
| Formula 1 | 3 | 8 way | No | Rubber feet | 150cm | £11.95 | Kempston Micro Electronics |
| Formula 2 | 2 | 8 way | No | Rubber feet | 150cm | £16.95 | Kempston Micro Electronics |
| Hypershot | 2 | n/a | No | Rubber feet | 110cm | £15.99 | Konami Ltd 01-4292446 |
| Joy Card | 2 | 8 way | No | Hand held | 120cm | £7.45 | Hudson Soft (UK) Ltd 01-458 3310 |
| Joy Sensor | Touch sensitive pad | Infinite | Yes | Hand held | 180cm | £19.95 | Consumer Electronics |
| Junior Pro | 1 | 8 way | No | Rubber feet | 150cm | £5.99 | Kempston Micro Electronics (0234) 856633 |
| JVC HCJ615 | 2 | 8 way | No | Suction cups | 150cm | £12.95 | JVC (UK) Ltd 01-450 2621 |
| Kraft Switch Hitter | 2 | 8 way | Yes | Rubber feet | 150cm | £14.95 | Silica Shop |
| Le Stik | 1 | Infinite | No | Hand held | 150cm | £19.95 | Silica Shop |
| Lightning Deluxe | 1 | 8 way | No | Suction cups | 120cm | £7.50 | Lightning 01-969 5255 |
| Microlink Beam Stick | 2 | 8 way | No | Hand held | n/a | TBA | Microlink (0730) 895296 |
| Mitsubishi ML50JY | 2 | 8 way | No | Suction cups | 150cm | £15.00 | Mitsubishi (UK) Ltd (0923) 770000 |
| Vulcan MSX | 2 | 8 way | No | Suction cups | 150cm | £11.95 | Vulcan Electronics 01-203 6366 |
| Panasonic CF2201 | 3 | 8 way | No | Rubber feet | 150cm | £19.95 | Panasonic (UK) Ltd (75) 34522 |
| Pointmaster | 1 | 8 way | No | Rubber feet | 150cm | £14.65 | Silica Shop |
| Pointmaster Pro | 1 | 8 way | Yes | Suction cups | 50cm | £14.95 | Silica Shop |
| Quickshot 1 | 2 | 8 way | No | Suction cups | 120cm | £11.95 | Spectravideo Ltd 01-330 0101 |
| Quickshot 2 | 2 | 8 way | Yes | Suction cups | 150cm | £14.95 | Spectravideo Ltd |
| Quickshot 5 | 3 | 8 way | Yes | Suction cup | 150cm | £14.95 | Spectravideo Lts |
| Sanyo NJ002 | 2 | 8 way | No | Suction cups | 150cm | £12.95 | Sanyo Marubeni (0923) 46363 |
| Scoreboard | 2 | 8 way | No | Rubber feet | 100cm | £28.95 | Kempston Micro Electronics |
| Slik Stik | 1 | 8 way | No | Plastic ridges | 150cm | £8.95 | Consumer Electronics 061-682 2339 |
| Sony JS-55 | 3 | 8 way | Yes | Hand held | 115cm | £19.95 | Sony (UK) Ltd (81) 61688 |
| Sony JS-75 | 3 | 8 way | Yes | H | Remote control | £64.95 | Sony (UK) Ltd |
| Starfighter | 1 | 8 way | No | Plastic ridges | 150cm | £10.95 | Consumer Electronics |
| Sumlock Pro-Ace Competition | 2 | 8 way | No | Rubber feet | 150cm | £12.95 | Sumlock Electronics 061-834 4233 |
| Super Champ | 2 | 12 way | No | Suction cups | 300cm | £12.95 | Dean Electronics (0344) 885661 |
| Tac-2 | 2 | 8 way | No | Plastic ridges | 180cm | £15.95 | Consumer Electronics |
| TG Enjoystick | 2 | 8 way | Yes | Suction cups | 100cm | £27.95 | Silica Shop |
| TG Trak-Ball | 1 | Infinite | Yes | Rubber feet | 200cm | £49.95 | Silica Shop |
| The Arcade | 1 | 8 way | No | Hand held | 150cm | £15.45 | Silica Shop |
| The Boss | 1 | 8 way | No | Rubber feet | 100cm | £17.95 | Consumer Games Ltd 01-508 5600 |
| The Kraft | 1 | 8 way | No | Hand held | 200cm | £9.95 | Silica Shop 01-309 1111 |
| Toshiba HX-J400 | 2 | Infinite | No | Rubber feet | 150cm | £12.95 | Toshiba (UK) Ltd (0276) 62222 |
| Tracker Ball RB2 | 2 | Infinite | Yes | Rubber feet | 100cm | £79.00 | Central Trading Exchange (0582) 64334 |
| Voltmace Delta 3SM | 3 | Infinite | Yes | Hand held | 130cm | £9.95 | Voltmace Ltd (0462) 894410 |
| Wico 3 way Deluxe (3 handles) | 2 | 8 way | No | Sticky feet | 150cm | £22.95 | CGL |
| Wico Red Ball | 2 | 8 way | Yes | Rubber feet | 150cm | £19.95 | CGL |
| Wico Trak-Ball | 2 | Infinite | No | Rubber feet | 150cm | £34.95 | CGL |

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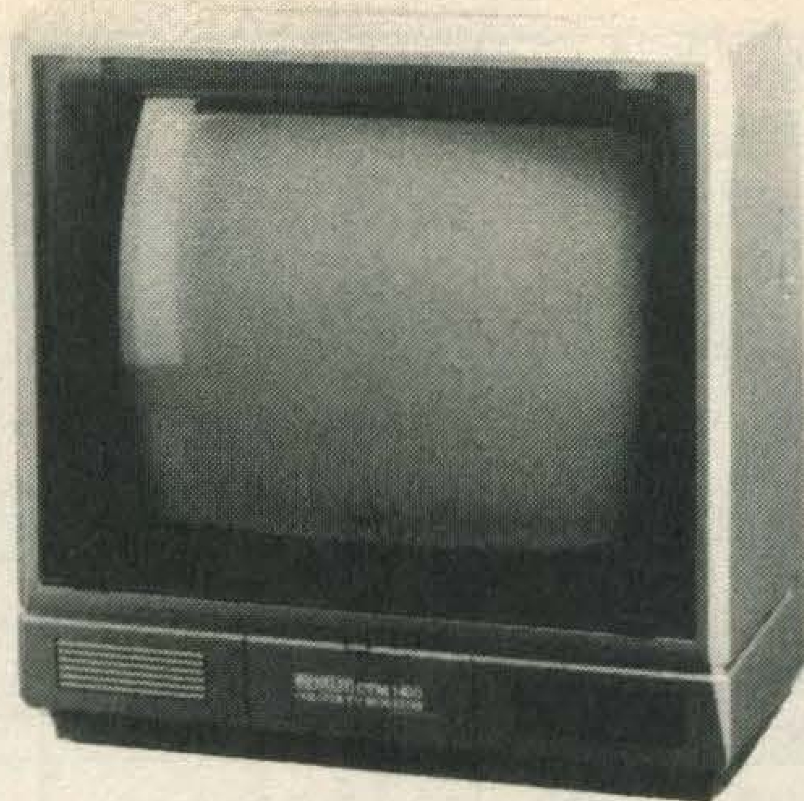
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# MITSUBISHI MSX COMPUTERS

Colour monitors have been designed specifically to display computer generated characters and graphics clearly and efficiently. Eye strain is also reduced.

Resolution refers to the number of pixels (computer defined dots) on the monitor display surface. High and medium resolutions contain higher pixel densities then the standard so can show more detailed images.

Cathode Ray Tubes (CRT) generate the monitor's visual display and the size, usually measured in inches refers to the picture diagonal.





Display depends on the monitor resolution. High and medium resolutions can display 80 characters across 25 lines. Standard displays 40 characters across 25 lines.

There are two main ways of sending a monitor signal. With RGB [red, green and blue] the three colours are sent as separate signals. Only the Sony and JVC will accept RGB monitors. PAL or Composite Video signals are sent with the three colours already synchronised.

Some monitors have the facility to switch to a green monochrome screen which is useful for applications such as word processing.

| Model | Resolution | C.R.T. | Display | Input | Green Screen Option | Built In Speaker | Brightness Contrast | Horizontal Vertical | Case Colour | Supplier | Price |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Commodore 1701 | Medium | 14in | 40x25 | PAL | No | Yes | Yes | No | Cream | Commodore (0536) 205555 | £230 |
| Cub 1431 AP/MS | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Beige | Microvitec (0274) 390011 | £259 |
| Cub 1431 AP/DS | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Beige | Microvitec | £259 |
| Cub 1451 AP/MS | Medium | 14in | 80x25 | RGB/PAL | No | Yes | Yes | Yes | Beige | Microvitec | £344 |
| Cub 1451 AP/DS | Medium | 14in | 80x25 | RGB/PAL | No | Yes | Yes | Yes | Beige | Microvitec | £344 |
| Cub 2030/CS | Standard | 20in | 80x25 | RGB/PAL | No | Yes | Yes | Yes | Beige | Microvitec | £443 |
| Ferguson MC01 | Standard | 14in | 40x25 | RGB | No | Yes | Yes | Yes | Dark Grey | Ferguson 01-807 3060 | £230 |
| Fidelity CM14 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Grey | Fidelity 01-965 8771 | £200 |
| Fidelity CTM1400 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Grey | Fidelity | £220 |
| Fidelity CTV20T | Standard | 20in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Teak | Fidelity | £300 |
| Fidelity CTV22T | Standard | 22in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Teak | Fidelity | £340 |
| Grundig P40125 | Medium | 35.6cm | 80x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Grundig 01-659 2468 | £220 |
| Grundig P40145 | Medium | 35.6cm | 80x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Grundig | £260 |
| Grundig P55145 | Medium | 50.8cm | 80x25 | RGB | No | Yes | Yes | Yes | Silver | Grundig | £360 |
| Grundig C2402 | Standard | 14in | 40x25 | RGB | No | Yes | Yes | No | Silver | Newark Video Centre (0636) 71475 | £287 |
| Grundig C3104 | Standard | 16in | 40x25 | RGB | No | Yes | Yes | No | Silver | Newark | £300 |
| Grundig C3404 | Standard | 16in | 40x25 | RGB/PAL | No | Yes | Yes | No | Silver | Newark | £344 |
| Grundig C60100 | Standard | 20in | 40x25 | RGB | No | Yes | Yes | No | Silver | Newark | £340 |
| Grundig C64100 | Standard | 20in | 40x25 | RGB/PAL | No | Yes | Yes | No | Silver | Newark | £378 |
| Grundig C70100 | Standard | 22in | 40x25 | RGB | No | Yes | Yes | No | Silver | Newark | £378 |
| Grundig C74100 | Standard | 22in | 40x25 | RGB/PAL | No | Yes | Yes | No | Silver | Newark | £418 |
| Grundig C84100 | Standard | 26in | 40x25 | RGB/PAL | No | Yes | Yes | No | Silver | Newark | £546 |
| Hantarex CT900/3 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | White | Hantarex 01-778 1414 | £297 |
| Hantarex CT900/D1 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | White | Hantarex | £297 |
| Hantarex CT900/D` | Medium | 14in | 80x25 | RGB | No | Yes | Yes | Yes | White | Hantarex | £435 |
| Hantarex CT900/D1 | Standard | 26in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | White | Hantarex | £483 |
| ITT RL 2315 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | No | Grey | ITT Consumer Products (0268) 3040 | £223 |
| ITT RL 2310/M | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | No | Grey | ITT | £259 |
| ITT CT 2600 | Medium | 22in | 80x25 | RGB/PAL | No | Yes | Yes | No | Teak | ITT | £344 |
| ITT CT 2700/M | Medium | 26in | 80x25 | RGB/PAL | No | Yes | Yes | No | Teak | ITT | £414 |
| Kaga Vision Ex | Standard | 12in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Cream | Data Efficiency (0442) 60155 | £248 |
| Kaga Vision II | Medium | 12in | 80x25 | RGB | No | No | Yes | Yes | Cream | Data Efficiency | £328 |
| Kaga Vision III | High | 12in | 80x25 | RGB | No | No | Yes | Yes | Cream | Data Efficiency | £459 |
| Luxor HR14 | High | 14in | 80x25 | RGB | No | No | Yes | No | Cream | Emco Electronics 01-737 0971 | £516 |
| Normende 1534 | Standard | 14in | 40x25 | PAL | No | Yes | Yes | Yes | Platinum, Black, Grey | Nordmende (0296) 20501 | £229 |
| Nordmende 3510 | Standard | 10in | 40x25 | PAL | No | Yes | Yes | Yes | Platinum, Black, Grey | Nordmende | £299 |
| Nordmende 3534 | Standard | 14in | 40x25 | PAL | No | Yes | Yes | Yes | Red, Grey | Nordmende | £249 |
| Nordmende 3636 | Standard | 16in | 40x25 | PAL | No | Yes | Yes | Yes | Grey | Nordmende | £299 |
| Nordmende 3630 | Standard | 20in | 40x25 | PAL | No | Yes | Yes | Yes | Platinum, Black, Grey | Nordmende | £299 |
| Nordmende 3532 | Standard | 22in | 40x25 | PAL | No | Yes | Yes | Yes | Walnut, Platinum, Black, Grey | Nordmende | £359 |
| Nordmende 5102 | Standard | 22in | 40x25 | PAL | No | Yes | Yes | Yes | Walnut Grey | Nordmende | £449 |
| Philips CT 2007 | Medium | 14in | 80x25 | RGB/PAL | No | Yes | Yes | No | Cream | Philips 01-689 2166 | £263 |
| Phoenix FTC-1203 | High | 12in | 80x25 | RGB | No | No | Yes | Yes | Cream | Emco Electronics | £459 |
| Portatel | Standard | 20in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Portatel (76) 88972 | £322 |
| Portatel Luxor | Standard | 16in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Portatel | £344 |
| Portatel 5634 | Standard | 22in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Portatel | £357 |
| Portatel | Standard | 26in | 40x25 | RGB/PAL | No | Yes | Yes | No | Silver | Portatel | £403 |
| Profeel KX 20PSI | Medium | 20in | 40x25 | RGB/PAL | No | No | Yes | Yes | Silver | Sony (81)61688 | £500 |
| Sabre | Medium | 14in | 80x25 | RGB | No | No | Yes | No | White | Cotron Electronics (0203) 21247 | £523.25 |
| Sabre-LP | Medium | 14in | 80x25 | RGB | No | No | Yes | No | White | Cotron Electronics | £561.20 |
| Sanyo CD3125 | Standard | 14in | 40x25 | RGB | No | No | Yes | Yes | Cream | Sanyo (0923) 46363 | £228.85 |
| Sanyo CD3195 | Standard | 14in | 40x25 | RGB/PAL | No | Yes | Yes | Yes | Silver | Sanyo | £309.35 |
| Sanyo CD3117 | Medium | 14in | 80x25 | RGB | No | No | Yes | Yes | Cream | Sanyo | £458.85 |
| Sanyo CRT50 | Medium | 14in | 80x25 | RGB | No | No | Yes | Yes | Silver | Sanyo | £458.85 |

# BUYERS GUIDE

## KEY

**Type: M** — Dot matrix printer. The image is printed by the impact of pins from a pin matrix, the particular pins determining the shape of the character. Dot matrix printers are very fast.

**D** — Daisywheel printer. These printers work rather like electronic typewriters, using a daisywheel of formed characters. Quality is high, but speeds are slower and you are limited to the characters on the daisywheel.

**T** — Thermal printer. The print head is heated, thus transferring ink to paper, using a matrix of needles. These printers run very quietly.

**I** — Inkjet printer. Squirts of ink are directed at the paper to form the characters. It is all relatively new and pricey.

**Matrix size:** Applicable only to dot matrix and thermal printers — the number of pins used to form a character. Maximum figures are given, the more, the better the quality.

**Maximum speed:** The number of characters per second (cps) that can be printed.

**Paper width:** The maximum width of paper the printer will take in inches.

**Paper feed: T** — Tractor feed. Continuous paper, perforated at the edges, is used and width is adjustable.

**P** — Pinfeed. As tractor feed, but paper width is fixed.

**F** — Friction feed. The sort of feed found on typewriters, for one sheet of paper at a time.

**Graphics: B** — Block graphics. Prints using set characters provided by the printer.

**H** — Hi-res graphics. The printer can print anything that appears on the screen, in text of graphics modes.

**Interface: C** — Centronics. The printer interface found on MSX computers.

**R** — RS232C. An alternative printer interface that can be added to MSX computers.

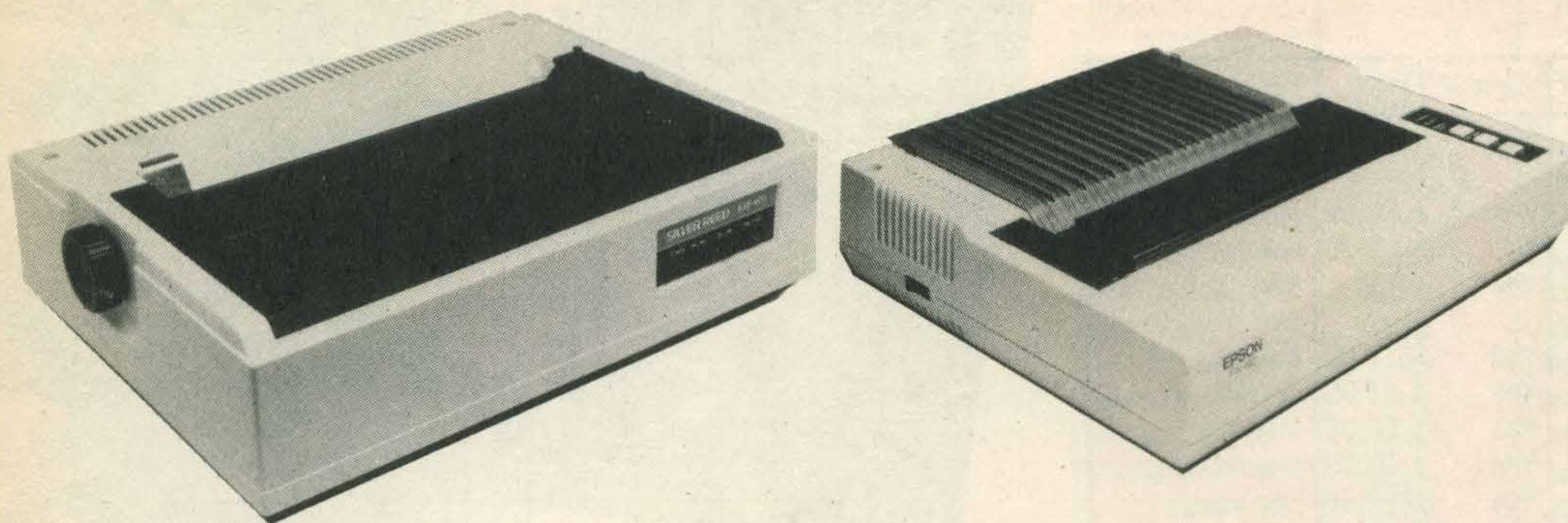
**Other: D** — the printer will print the lower portion of characters that extend below the line (g, j etc.)

**M** — the printer has a slower printing speed to give near letter quality printing.

**B** — the printer is battery powered.

**C** — the printer prints in more than one colour.

| Model | Type | Matrix Size | Max Speed | Paper Widths | Paper Feed | Graphics | Interface | Other | Price | Supplier |
|---|---|---|---|---|---|---|---|---|---|---|
| ACT Winter 11 | M | 9× 9 | 100cps | 10 | T,F | H | C | D | £339 | ACT |
| ACT Writer 12 | M | 9× 7 | 163cps | — | T,F | H | C | D | £799 | ACT |
| ACT Writer 12S | M | 9 × 7 | 180cps | 15 | T,F | H | C | D | £799 | ACT |
| ACT Writer 12FC | D | NA | 180cps | 15 | T,F | H | C | D,C | £914 | ACT |
| Brother HR5 | M | 9 × 9 | 30cps | 8 | F | H | C,R | B,D | £181 | Brother |
| Brother EP44 | M | 24 × 18 | 16cps | 8 | F | — | R | K,B | £261 | Brother |
| Brother EP120 | M | 12 × 18 | 120cps | 10 | T,F | H | C,R | M,D | £305 | Brother |
| Brother HR15 | D | — | 13cps | 13.5 | F | — | C,R | D,C | £512 | Brother |
| Brother HR25 | D | NA | 25cps | 16.5 | T,F | — | C,R | D,C | £863 | Brother |
| Brother HR35 | D | NA | 35cps | 16.5 | T,F | — | C,R | D,C | £1,064 | Brother |
| Canon PW1080A | M | 11 × 9 | 160cps | 10 | T,F | H | C | D | £401 | Canon |
| Canon PW1156A | M | 11 × 9 | 160cps | 17 | T,F | H | C | D | £516 | Canon |
| Canon PJ1080A | I | 7 × 9 | 37cps | 8.5 | F | H | C | C | £574 | Canon |
| Centronics GLP 30101-6 | M | 9 × 9 | 50cps | 8 | T,F | H | C | D | £230 | Centronics |
| Centronics Horizon 80 | M | 11 × 9 | 160cps | 12 | T,F | H | C | D,M | £541 | Centronics |
| Centronics Horizon 156 | M | 11 × 9 | 160cps | 16.5 | T,F | H | C | D,M | £759 | Centronics |
| Centronics Prinstation Q40 | M | 7 × 8 | 160cps | 10 | T | M | C,R | D | £1,208 | Centronics |
| Citizen 560P | M | 7 × 5 | 65cps | 3½ | F | B | C,R | C | £137 | Datac Ltd |
| Citizen 510 | M | 5 × 7 | 45cps | 3 | F | B | C,R | — | £205 | Datac |
| C. Itoh 7500 | M | 9 × 9 | 105cps | 11 | T,F | B | C | — | £403 | C. Itoh |
| C. Itoh 8510S | M | 9 × 9 | 180cps | 11 | T,F | H | C,R | D | £518 | C. Itoh |
| C. Itoh 8510SC | M | 9 × 9 | 180cps | 11 | T,F | H | C,R | D,C | £633 | C. Itoh |
| C. Itoh 1550S | M | 9 × 9 | 180cps | 15 | T,F | H | C,R | D | £748 | C. Itoh |
| C. Itoh 1550SC | M | 9 × 9 | 180cps | 15 | T,F | H | C,R | D,C | £863 | C. Itoh |
| Colourjet 132 | I | 5 × 8 | 40cps | 8 | F | H | C | C,D | £633 | Integrex |
| Daisystep 2000 | D | NA | 20cps | 13 | F | — | C | — | £334 | Micro P. |
| Dyneer 12 | D | NA | 12cps | 11.5 | F | — | C | D | £316 | X-Data |
| Dyneer DW16 | D | NA | 16cps | 16 | F | — | C,R | D | £378 | X-Data |
| Dyneer DW20 | D | NA | 20cps | 13 | F | — | C,R | D | £615 | X-Data |
| Epson P-40 | T | 7 × 9 | 45cps | 4 | F | H | C | D,B | £100 | Epson |
| Epson RX-80/T | M | 9 × 9 | 100cps | 10 | T | H | C | D | £286 | Epson |
| Epson RX-80/FT | M | 9 × 9 | 100cps | 10 | T,F | H | C | D | £328 | Epson |
| Epson FX-80 | M | 9 × 9 | 160cps | 10 | T | H | C | D | £503 | Epson |
| Epson DX100 | D | NA | 13cps | 11 | F | — | C,R | — | £546 | Epson |
| Epson TX-80 | M | 9 × 9 | 160cps | 10 | T | H | C | D | £644 | Epson |
| Epson MX-100 | M | 9 × 9 | 100cps | 16 | T | H | C | D | £546 | Epson |
| Epson FX-100 | M | 9 × 9 | 80cps | 16 | T | H | C | D | £654 | Epson |
| Getex D14 | D | NA | 13cps | 13.5 | F | — | C,R | — | £288 | Geveke |
| Getex S11CQ | M | 9 × 7 | 100cps | — | T,F | H | C,R | D | £516 | Geveke |
| Getex S31 CQ | M | 9 × 7 | 100cps | 15.5 | T,F | H | C,R | D | £460 | Geveke |
| Honeywell L11-1 | M | 9 × 9 | 80cps | — | T,F | H | C | D | £401 | Geveke |
| Honeywell S11-CQ | M | 16 × 35 | 100cps | — | T,F | H | R | M,D | £516 | Geveke |
| Honeywell L31CQ | M | 11 × 9 | 150cps | 12 | T | B | C | D | £776 | Geveke |
| Janome CP1018 | M | — | 180cps | 13 | T | B | C | C,D | £892 | Thame Systems |
| Juki G100 | D | — | 18cps | 15.5 | F | — | C | — | £459 | Micro P. |
| Juki G300 | D | — | 40cps | 15.5 | F | — | C | — | £919 | Micro P. |
| Mannesman Tally 80 | M | 9 × 7 | 80cps | 10 | T,F | B | C,R | D | £250 | Mannesman Tally |
| Mannesman Tally 160 | M | 9 × 7 | 160cps | 10 | T,F | B | C,R | D | £631 | Mannesman Tally |
| Mitsui 2200 | M | 9 × 9 | 180cps | 10 | F | H | C | D | £516 | Thame |
| Mitsui 4200 | M | 9 × 9 | 180cps | 15 | F | H | C | D | £643 | Thame |
| MP 165 | M | 17 × 17 | 160cps | — | T,F | H | R | M,D | £309 | Micro P. |
| NEC PC 8023 | D | 9 × 7 | 120cps | 9 | T,P,F | H,G | C | D | £229 | NEC |
| NEC Pinwriter P2 | M | 7 × 9 | 180cps | 10 | T,F | — | C,R | D,M | £747 | NEC |
| OKI Microline 82A | M | 9 × 9 | 120cps | 9.5 | P,F | B | C,R | D,M | £344 | X-Data |
| OKI Microline 92 | M | 9 × 9 | 160cps | 9.5 | P,F | H | C,R | D,M | £493 | X-Data |
| OKI Microline 830 | M | 9 × 9 | 120cps | 15.5 | T,F | B | C,R | D | £562 | X-Data |
| OKI Microline 93 | M | 9 × 9 | 160cps | 15.5 | T,F | H | C | D,M | £673 | X-Data |
| OKI Microline 84 | M | 9 × 9 | 200cps | 15.5 | T,F | B | C | — | £919 | X-Data |
| Olivetti DM5060 | M | 9 × 7 | 120cps | — | F | H | C | D | £459 | Olivetti |
| Olivetti DM4100 | M | 9 × 7 | 120cps | — | T,F | H | C | D | £666 | Olivetti |
| Olympia Compact | D | NA | 14cps | 13.5 | T,F | — | C,R | — | £459 | Intelligent |
| Olympia ESW 102 | D | NA | 17cps | 17 | F | — | C,R | — | £650 | Intelligent |
| Panther DX109 | M | 9 × 9 | 96cps | 10 | T,F | H | C | D | £229 | Datac |




| Model | Type | Matrix Size | Max Speed | Paper Widths | Paper Feed | Graphics | Interface | Other | Price | Supplier |
|---|---|---|---|---|---|---|---|---|---|---|
| Panther II DX120 | M | 9 x 9 | 120cps | 10 | T,F | H | C | D,M | £367 | Datac |
| Paper Tiger 8010 | M | 36 x 18 | 180cps | 9 | T,F | H | C,R | D,M | £539 | Data-prod |
| Paper Tiger 8020 | M | 36 x 18 | 180cps | 14 | T,F | H | C,R | D,M | £742 | Data-prod |
| Qume Letter Pro 20 | D | NA | 20cps | 13 | F | — | R,C | — | £604 | Qume |
| Remstar 201 | D | NA | 13.3cps | 13.5 | F | — | C,R | K,D | £454 | PMS |
| Seikosha GP-50A | M | 5 x 8 | 40cps | 5 | F | H | C | — | £100 | DRG |
| Seikosha GP-500A | M | 5 x 7 | 50cps | 10 | T | — | C,R | — | £180 | DRG |
| Seikosha 100A | M | 5 x 7 | 50cps | 10 | T | — | C,R | — | £169 | DRG |
| Seikosha GP-550A | M | 9 x 8 | 50cps | 10 | P,F | H | C | M,D | £230 | DRG |
| Seikosha GP-250X | M | 5 x 7 | 50cps | 10 | P,F | H | C,R | D | £270 | DRG |
| Seikosha 700A | M | 5 x 8 | 50cps | 10 | P,F | H | C,R | C | £350 | DRG |
| Shinwa CPA80 | M | 13 x 9 | 100cps | 10 | T,F | B | C | D | £229 | Micro P. |
| Silver Reed EXP400 | D | NA | 12cps | 12 | F | — | C,R | D | £288 | Silver Reed |
| Silver Reed EXP500 | D | NA | 16cps | 13 | F | — | C,R | D | £615 | Silver Reed |
| Silver Reed EXP550 | D | NA | 19cps | 17 | F | — | C,R | D | £654 | Silver Reed |
| Smith Corona Fastext 80 | M | 9 x 8 | 80cps | 11 | T,F | H | C | D | £224 | Smith Corona |
| Smith Corona TP1 | D | NA | 11cps | 13 | F | — | R | D | £250 | Smith Corona |
| Smith Corona D100 | M | 9 x 8 | 120cps | 11 | T,F | H | C | D | £286 | Smith Corona |
| Smith Corona L1000 | D | NA | 12cps | 13 | F | — | C,R | D | £299 | Smith Corona |
| Smith Corona D200 | M | 17 x 18 | 160cps | 11 | T,F | H | C,R | M,D | £483 | Smith Corona |
| Smith Corona EC1300 | D | NA | 14cps | 14 | F | — | C,R | D,K | £569 | Smith Corona |
| Smith Corona D300 | M | 17 x 18 | 160cps | 15 | T,F | H | C,R | M,D | £633 | Smith Corona |
| Sony PRN-C41 | Pens | NA | 10cps | — | F | H | C | D,C,G | £278 | Sony |
| Star STX-80 | T | 9 x 10 | 60cps | 10 | F | B | C | D | £171 | West |
| Star Gemini 10 | M | 9 x 9 | 120cps | 10 | F | B,H | C | D | £286 | West |
| Star Gemini 15 | M | 9 x 9 | 120cps | 15 | F | B | C | D | £413 | West |
| Star Power type | D | NA | 18cps | 10 | F | — | C | D | £436 | West |
| Star Delta 10 | M | 9 x 11 | 160cps | 10 | T,F | B | C,R | D | £459 | West |
| Star Delta 15 | M | 9 x 11 | 160cps | 15 | T,F | B | C,R | D | £610 | West |
| Star Radix 10 | M | 9 x 11 | 200cps | 10 | T,F | B | C,R | M,D | £620 | West |
| Star Radix 15 | M | 9 x 11 | 200cps | 15 | T,F | B | C,R | M,D | £735 | West |
| Taxan KP-810 | M | 9 x 9 | 140cps | 10 | T,F | H | C,R | D | £367 | Data E. |
| Taxan KP-910 | M | 9 x 9 | 140cps | 17 | T,F | H | C | D | £459 | Data E. |
| Toptronic 15 | D | NA | 13cps | 13.5 | F | H | C,R | — | £375 | PMS |
| Toshiba HX-P570 | Pens | NA | –cps | 12 | F | H | C | C,D,G | £250 | Toshiba |
| Toshiba HX-P550 | M | — | 105cps | 16 | F | H | C | D,G | £350 | Toshiba |
| Toptronic 15 | D | — | 13.3 | 13.5 | F | — | C,R | K,D | £431 | PMS |
| Triumph Adler TRD 7020 | D | NA | 20cps | 14 | F | — | C,R | D | £431 | Triumph Adler |
| Triumph Adler DRH 80/1 | M | 7 x 9 | 80cps | 12 | T,F | H | C,R | D | £520 | Triumph Adler |
| Triumph Adler DRH 136 | M | 7 x 9 | 120cps | — | T,F | H | C,R | D,M | £621 | Triumph Adler |
| Turbo 20 | D | NA | 20cps | 15 | F | — | C | — | £344 | OEM |
| VRX80 | M | 7 x 9 | 100cps | 9.5 | T,F | H | C,R | D | £454 | Integrex |

**K** — the printer has a keyboard, so can be used as a typewriter.

**F** — the printer can be used as a viewdata terminal.

**G** — the printer can print MSX graphics.

## ADDRESS

ACT — (021) 5012284
Brother Office Equipment — 061-330 6531
Canon (UK) Ltd — 01-773 3173
Centronics — 01-581 1011
C. Itoh Electronics Co. Ltd — 01-946 4960
Datac Ltd — 061-941 2361
Data Efficiency — (0442) 60155
Dataproducts (Retail Division) Ltd — (0784) 38733
DRG Business Machines — (0934) 419914
Epson — 01-902 8892
Euro Pacific Computers (Int) Ltd — (0245) 26590
Geveke Electronics — (04867) 88676
Integrex Ltd — (0283) 215432
Intelligent Interfaces — (0789) 296879
Mannesman Tally Ltd — (0734) 788711
Microntel — (0273) 205099
Micro Peripherals — (0256) 473232
NEC — 01-267 7000
Newbury Data — (0784) 61500
OEM Peripherals — 01-748 8404
Olivetti Peripheral Equipment — 01-785 6666
PMS Developments — (0432) 265768
Qume (UK) Ltd — (0734) 584646
Silver Reed (UK) Ltd — (0923) 45976
Smith Corona Data Products — 01-900 1222
Sony (UK) Ltd — (81) 61688
Thame Systems — (084) 421 6698
Toshiba (UK) Ltd — (0276) 62222
Triumph Adler — 01-253 5608
WBM Business Supplies Ltd — (04862) 66444
West Coast Peripherals — (0734) 752273
X-Data — (0753) 72331

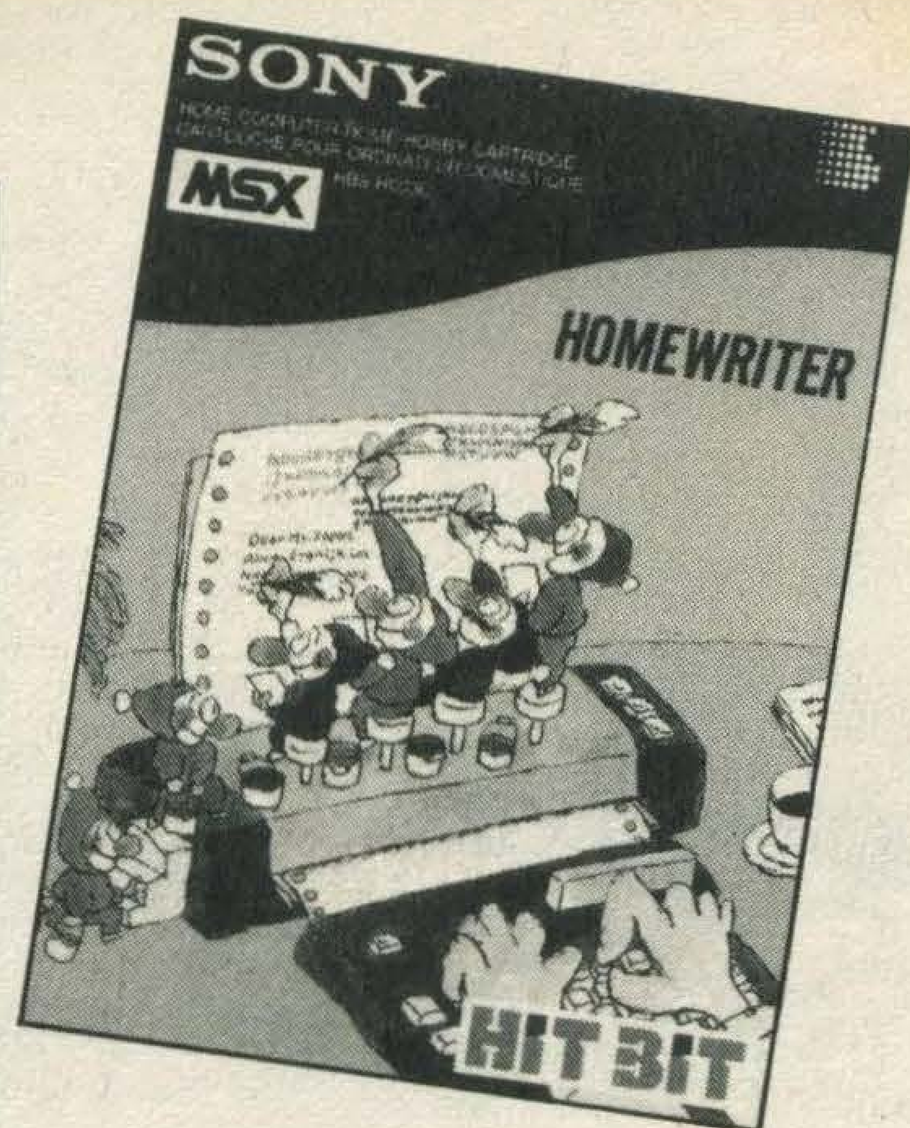
## GAMES AND SIMULATORS






| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| 3D Golf | Arcade | Cass | No | £7.95 | Toshiba |
| 737 Flight Simulator | Simulator | Cass | Yes | £9.59 | Microsoft |
| Adventure Quest | Adventure | Cass | No | £9.95 | Level 9 |
| Alpha Blaster | Arcade | Cass | Yes | TBA | Aackosoft |
| Antarctic Adventure | Arcade | Cart | Yes | £17.85 | Konami |
| Ant Attack | Arcade | Cass | Yes | £7.95 | Quicksilva |
| Anty | Arcade | Cass | Yes | £6.95 | Morwood |
| Armoured Assault | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Athletic Land | Arcade | Cart | Yes | £17.85 | Konami |
| Backgammon | Traditional | Cass | Yes | £8.95 | Electric |
| Battle Cross | Arcade | Cart | Yes | £18.00 | Sony |
| Battleship Clapton | Arcade | Cass | Yes | £7.95 | Toshiba |
| Beam Rider | Arcade | Cass | Yes | £11.99 | Activision |
| Binary Land | Arcade | Cass | Yes | £8.95 | Kuma |
| Blagger | Arcade | Cass | Yes | £7.95 | Alligata |
| BMX Racers | Arcade | Cass | Yes | £1.99 | Mastertronic |
| Boardello | Traditional | Cass | No | £7.95 | Bubble Bus |
| Bugaboo (The Flea) | Arcade | Cass | Yes | £7.95 | Quicksilva |
| Breakout | Arcade | Cart | Yes | £18.80 | Panasonic |
| Bridge | Traditional | Cass | No | £9.95 | Alligata |
| Buzz Off | Arcade | Cass | Yes | £8.95 | Electric |
| Cannon Fighter | Arcade | Cass | Yes | £6.95 | Morwood |
| Cave Adventure | Adventure | Cass | No | £5.95 | Knights |
| Chuckie Egg | Arcade | Cass | Yes | £6.90 | A & F |
| Circus Charlie | Arcade | Cart | Yes | £14.95 | Konami |
| Coco and the Castle | Arcade | Cass | Yes | £6.95 | Kuma |
| Colossal Adventure | Adventure | Cass | No | £9.95 | Level 9 |
| Comic Bakery | Arcade | Cart | Yes | £14.95 | Konami |
| Computer Billiards | Traditional | Cart | Yes | £15.00 | Sony |
| Crazy Bullet | Arcade | Cart | Yes | £18.80 | Panasonic |
| Crazy Golf | Arcade | Cass | Yes | £7.95 | Mr Micro |
| Crazy Train | Arcade | Cart | Yes | £18.00 | Sony |
| Cribbage | Traditional | Cass | No | £5.95 | Kuma |
| Cross Force | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Cubit | Strategy | Cass | Yes | £7.95 | Mr Micro |
| Daredevil Denis | Arcade | Cass | Yes | £7.95 | Visions |
| Decathlon | Arcade | Cass | Yes | £11.99 | Activision |
| Disc Warrior | Arcade | Cass | Yes | £7.95 | Alligata |
| Dog Fighter | Arcade | Cass | No | £6.95 | Kuma |
| Dorodon | Arcade | Cart | Yes | £18.00 | Sony |
| Driller Tanks | Arcade | Cass | No | £8.95 | Kuma |
| Dungeon Adventure | Adventure | Cass | No | £9.95 | Level 9 |
| Emerald Isle | Adventure | Cass | No | £6.95 | Level 9 |
| Eric & The Floaters | Arcade | Cass | Yes | £5.95 | Kuma |
| Exploding Atoms | Strategy | Cass | No | £5.95 | Knights |
| Fire Rescue | Arcade | Cass | No | £7.95 | Kuma |
| Flightpath 77 | Simulator | Cass | Yes | £6.95 | Anirog |
| Flipper Slipper | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Frantic Freddy | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Fred | Arcade | Cass | Yes | £7.95 | Quicksilva |
| Glug Glug | Arcade | Cass | Yes | TBA | CRL |
| Golf | Traditional | Cart | Yes | £18.80 | Panasonic |
| Grid Runner | Arcade | Cass | Yes | £5.00 | Llamasoft |
| Gumshoe Logic | Strategy | Cass | No | £9.20 | Megacycal |
| H.E.R.O. | Arcade | Cass | Yes | £11.99 | Activision |
| Hero | Arcade | Cass | Yes | £3.95 | Microcom |
| Hiway Star | Arcade | Cart | Yes | £18.80 | Panasonic |
| Holdfast | Strategy | Cass | No | £5.95 | Kuma |
| Hole In One | Traditional | Cart | Yes | £14.95 | Morwood |
| Hot Shoe | Arcade | Cass | Yes | £5.95 | Longman |
| Humphrey | Arcade | Cass | Yes | £7.95 | Mr Micro |
| Hunchback | Arcade | Cass | Yes | £6.90 | Ocean |
| Hustler | Traditional | Cass | Yes | £6.99 | Bubble Bus |
| Hyper Sports | Arcade | Cart | Yes | £14.95 | Konami |
| Hyper Sports 2 | Arcade | Cart | Yes | £14.95 | Konami |
| Hyper Viper | Arcade | Cass | No | £7.95 | Kuma |
| I.G.I. | Arcade | Cass | Yes | £3.95 | Microcom |
| Illegus | Arcade | Cart | Yes | £18.80 | Panasonic |
| Jet Bomber | Arcade | Cass | Yes | TBA | Aackosoft |
| Jet Fighter | Arcade | Cass | Yes | TBA | Aackosoft |
| Jet Set Willy | Arcade | Cass | Yes | £7.95 | Software Proj |
| Juno First | Arcade | Cart | Yes | £18.00 | Sony |
| Lazy Jones | Arcade | Cass | Yes | £8.95 | Terminal |
| Le Mans | Arcade | Cass | No | £9.95 | Electric |
| Les Flics | Arcade | Cass | Yes | £7.95 | PSS |
| Lords Of Time | Adventure | Cass | No | £9.95 | Level 9 |
| Knight Othello | Strategy | Cass | No | £5.95 | Knights |
| Magic Carpet | Arcade | Cass | Yes | £1.99 | Mastertronic |
| Manic Miner | Arcade | Cass | Yes | £7.95 | Software Proj |
| Marine Battle | Arcade | Cart | Yes | £18.80 | Panasonic |
| Maxima | Arcade | Cass | Yes | £7.95 | PSS |
| Midnight Building | Arcade | Cart | Yes | £18.80 | Panasonic |
| Midway | Arcade | Cart | Yes | £18.80 | Panasonic |
| Mind Control | Arcade | Cass | Yes | £1.99 | Mastertronic |
| Mr Ching | Arcade | Cart | Yes | £14.95 | Morwood |
| Mr Wong's Laundry | Arcade | Cass | Yes | £6.95 | Artic |
| MSX 21 | Traditional | Cart | No | £18.80 | Panasonic |
| MSX Darts | Traditional | Cass | Yes | £4.95 | Orpheus |
| Ninja | Arcade | Cass | Yes | £6.95 | Kuma |
| Norseman | Arcade | Cass | Yes | £8.95 | Electric |
| Nug-It | Arcade | Cass | Yes | £3.95 | Microcom |
| Oh Mummy! | Arcade | Cass | Yes | £5.95 | Longman |
| Out Space | Arcade | Cass | Yes | £6.95 | Mirage |
| Packie | Arcade | Cass | Yes | £4.95 | Microcom |
| Pairs | Arcade | Cart | Yes | £18.80 | Panasonic |
| Panic Junction | Arcade | Cass | Yes | £6.95 | Morwood |
| Panzer Attack | Strategy | Cass | No | £7.95 | Lothlorien |
| Pinball | Arcade | Cass | No | £7.95 | Toshiba |
| Pineapply | Arcade | Cart | Yes | £18.80 | Panasonic |
| Pitfall II | Arcade | Cass | Yes | £11.99 | Activision |
| Polar Star | Arcade | Cass | Yes | £7.95 | Toshiba |
| Punchy | Arcade | Cass | Yes | £7.95 | Mr Micro |
| Pyramid Warp | Arcade | Cass | Yes | £7.95 | Toshiba |
| Return To Eden | Adventure | Cass | No | £9.95 | Level 9 |
| River Raid | Arcade | Cass | Yes | £11.99 | Activision |
| Rollerball | Arcade | Cart | Yes | £14.95 | Morwood |
| S.A.S.A. | Arcade | Cart | Yes | £18.80 | Panasonic |
| Sector Alpha | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Shark Hunter | Arcade | Cass | Yes | £9.95 | Electric |
| Smash Out | Arcade | Cass | Yes | £5.95 | Knights |
| Snooker | Traditional | Cass | Yes | £8.95 | Visions |
| Snowball | Adventure | Cass | No | £9.95 | Level 9 |
| Sorcery | Arcade | Cass | Yes | £8.95 | Virgin |
| Space Shuttle | Simulation | Cass | Yes | £11.99 | Activision |
| Space Walk | Arcade | Cass | Yes | £1.99 | Mastertronic |
| Sparkie | Arcade | Cart | Yes | £18.00 | Sony |
| Special Operations | Adventure | Cass | No | £6.95 | MC Lothlorien |
| Spectron | Arcade | Cass | Yes | £6.95 | Spectravideo |
| Spooks & Ladders | Arcade | Cass | No | £6.95 | Kuma |
| Squish 'em | Arcade | Cart | Yes | £18.80 | Panasonic |
| Star Avenger | Arcade | Cass | Yes | £6.95 | Kuma |
| Starship Simulator | Arcade | Cart | Yes | £18.80 | Panasonic |
| Step Up | Arcade | Cart | Yes | £14.95 | Morwood |
| Stop The Express | Arcade | Cass | Yes | £6.95 | Kuma |
| Super Billiards | Traditional | Cart | Yes | £14.95 | Morwood |
| Superchess | Traditional | Cass | No | £6.95 | Kuma |
| Super Cobra | Arcade | Cart | Yes | £14.95 | Konami |
| Supermaze | Strategy | Cass | Yes | £6.95 | Morwood |






| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| Revise Physics | Physics | Cass | No | £8.50 | Megacycal |
| Simple Addition 1 | Maths | Cass | No | £7.95 | Spectravideo |
| Simple Subtraction 1 | Maths | Cass | No | £7.95 | Spectravideo |
| Spanish Is Fun | Language | Cass | No | £7.95 | CDS |
| Star Words | Spelling | Cass | No | £6.95 | Spectravideo |
| Sum Measure | Maths | Cass | No | £14.95 | Ampalsoft |
| Sum Takeaway | Maths | Cass | No | £14.95 | Ampalsoft |
| Sum Times | Maths | Cass | No | £14.95 | Ampalsoft |
| Sum Weights | Maths | Cass | No | £14.95 | Ampalsoft |
| Teach Electricity | Physics | Cass | No | £9.20 | Megacycal |
| The Sphinx Quiz | General | Cass | No | £9.20 | Megacycal |
| Typing Tutor | Typing | Cass | No | £5.95 | Knights |
| Uni's Learning | Maths | Cass | No | £6.95 | Spectravideo |
| Word Wobbler | Words | Cass | Yes | £7.95 | Longman |

| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| Supermind | Strategy | Cass | Yes | £6.95 | Morwood |
| Superpuzzle | Strategy | Cass | Yes | £6.95 | Morwood |
| Super Snake | Arcade | Cart | Yes | £14.95 | Morwood |
| Swamp | Arcade | Cass | Yes | £3.95 | Microcom |
| Tawara | Arcade | Cart | Yes | £18.80 | Panasonic |
| Tele Bunnie | Arcade | Cart | Yes | £18.80 | Panasonic |
| Tennis | Arcade | Cart | Yes | £14.95 | Konami |
| The Snowman | Arcade | Cass | No | £7.95 | Quicksilva |
| The Wreck | Arcade | Cass | Yes | £9.95 | Electric |
| Time Bandits | Arcade | Cass | Yes | £6.95 | PSS |
| Time Pilot | Arcade | Cart | Yes | £14.95 | Konami |
| Track & Field 1 | Arcade | Cart | Yes | £14.95 | Konami |
| Track & Field 2 | Arcade | Cart | Yes | £14.95 | Konami |
| Turboat | Arcade | Cart | Yes | £18.80 | Panasonic |
| Turmoil | Arcade | Cart | Yes | £18.80 | Panasonic |
| Vicious Viper | Arcade | Cass | Yes | £5.95 | Knights |
| Waffle | Arcade | Cass | Yes | £3.95 | Microcom |
| Weedy | Arcade | Cass | Yes | £3.95 | Microcom |
| Zakil Wood | Adventure | Cass | No | £7.95 | Mr Micro |
| Zaxxon | Arcade | Cass | Yes | £11.95 | Electric |
| Zenji | Arcade | Cass | Yes | £11.99 | Activision |

## EDUCATIONAL

| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| 3D Hypermath | Maths | Cass | Yes | £7.95 | Longman |
| Adder Sums | Maths | Cass | No | £14.95 | Ampalsoft |
| BMX Number Jump | Maths | Cass | Yes | £7.95 | Longman |
| Calculation 1 | Maths | 3 Cass | No | £9.95 | Morwood |
| Calculation 2 | Maths | 3 Cass | No | £9.95 | Morwood |
| Challenge My Bluff | General | 2 Cass | No | £9.95 | Soft Cat |
| French Is Fun | Language | Cass | No | £7.95 | CDS |
| Fun Sums | Maths | Cass | No | £14.95 | Ampalsoft |
| Fun With Words | Reading | Cass | No | £14.95 | Ampalsoft |
| German Is Fun | Language | Cass | No | £7.95 | CDS |
| Gods Of The Tomb | General | Cass | No | £9.20 | Megacycal |
| Introducing Circle 1 | Maths | Cass | No | £7.95 | Spectravideo |
| Introducing Circle 2 | Maths | Cass | No | £7.95 | Spectravideo |
| Intro Percentages | Maths | Cass | No | £7.95 | Spectravideo |
| Intro To BASIC | BASIC | Cass | No | £6.95 | Spectravideo |
| Intro To Numbers | Maths | 3 Cass | No | £9.95 | Morwood |
| Italian Is Fun | Language | Cass | No | £7.95 | CDS |
| Junior Maths | Maths | Cass | No | £5.95 | Knights |
| Kriss Kross Quiz | General | 2 Cass | No | £9.95 | Soft Cat |
| Let's Go MSX | BASIC | 2 Cass | No | £9.95 | Soft Cat |
| Mastermind | General | Cass | No | £9.99 | Mirrorsoft |
| Mastermind Quiz | General | Cass | No | £5.99 | Mirrorsoft |
| Math Bug | Maths | Cass | Yes | £6.95 | Spectravideo |
| Maths Invader | Maths | Cass | Yes | £6.95 | Stell Software |
| Memory | Training | 3 Cass | No | £9.95 | Morwood |
| Monkey Academy | Maths | Cart | Yes | £17.85 | Konami |
| Number Painter | Maths | Cass | Yes | £8.95 | ASK |
| Quiz Safari | General | Cass | No | £9.20 | Megacycal |
| MSX BASIC Tutorial | BASIC | Cass | No | £5.95 | Knights |
| Reasoning | Training | 3 Cass | No | £9.95 | Morwood |
| Reflexes | Training | 3 Cass | No | £9.95 | Morwood |
| Revise Computers | Computing | Cass | No | £8.50 | Megacycal |

## BUSINESS

| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| Aackobase | Database | Cass | No | £40.00 | Aackosoft |
| Aackotext | Text | Cass | No | £40.00 | Aackosoft |
| Cards | Database | Cart | No | £49.00 | Computer Mates |
| Cash Accounts | Financial | Cart | No | £149.0 | Computer Mates |
| Cash Book | Financial | Cass | No | £14.95 | Micro Aid |
| Crediquote | Retail | Cart | No | £100.0 | Office Junior |
| Database | Database | Cass | No | £19.95 | Kuma |
| Double Entry | Financial | Cart | No | £99.00 | Computer Mates |
| Financial Calculator | Financial | Cass | No | £6.95 | Spectravideo |
| Homewriter | Text | Cart | No | £39.95 | Sony |
| Knights BudgetA/C | Financial | Cass | No | £14.95 | Knights |
| Knights Mail List | Addresses | Cass | No | £14.95 | Knights |
| Mail Shot | Files | Cart | No | £99.00 | Computer Mates |
| Marginator | Financial | Cass | No | £10.00 | Office Junior |
| Memo-Calc | Database | Cass | No | £14.95 | Micro Aid |
| MST-Calc | Speadsheet | Cass | No | £12.95 | MST |
| Partsearch | Stock | Cass | No | £100.0 | Office Junior |
| Payroll | Wages | Cart | No | £99.00 | Computer Mates |
| Payroll | Wages | Cass | No | £29.95 | Micro Aid |
| Spectra Chequebook | Financial | Cass | No | £6.95 | Spectravideo |
| Shoppastoppa | Retail | Cass | No | £100.0 | Office Junior |
| Spreadsheet | Spreadsheet | Cart | No | £49.00 | Computer Mates |
| Stock Control | Stock | Cass | No | £34.95 | Kemp |
| Tasword MSX | Text | Cass | No | £13.90 | Tasman |
| Wdpro | Text | Cass | No | £29.95 | Kuma |
| Word Processor | Text | Cart | No | £49.00 | Computer Mates |
| VAT Cracker | Financial | Cass | No | £10.00 | Office Junior |

## UTILITIES

| Title | Type | | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| Champ | Assembler | Cass | No | £12.95 | PSS |
| Games Designer | Programming | Cass | Yes | £9.95 | Quicksilva |
| Go-Sprite | Graphics | Cass | Yes | £9.95 | Mirrorsoft |
| Hisoft Devpack | Ass/Disass | Cass | No | £19.95 | Hisoft |
| Hisoft Pascal | Pascal | Cass | No | £29.95 | Hisoft |
| Kuma Forth | Forth | Cass | No | £39.95 | Kuma |
| Machine Code | Assembler | Cass | No | £5.95 | Knights |
| Speech Synthesizer | Voice | Cart | No | £69.50 | Kuma |
| The Games Creator | Programming | Cass | Yes | £12.95 | Mirrorsoft |
| Tasprint MSX | Printing | Cass | No | £9.90 | Tasman |
| Zen Assembler | Assembler | Cass | No | £19.95 | Kuma |

## MISCELLANEOUS

| Title | Type | Format | Joystick | Price | Supplier |
|---|---|---|---|---|---|
| Address Book | Addresses | Cass | No | £6.95 | Spectravideo |
| Communications | Viewdata | Cass | No | £19.95 | Kuma |
| Home Budget | Financial | Cass | No | £14.95 | Kuma |
| MSX Demonstrator | Demonstrator | Cass | No | £5.95 | Knights |
| Music Mentor | Musical | Cass | Yes | £6.95 | Spectravideo |
| Musiwriter | Musical | Cart | No | £19.95 | Music Sales |

# BUYERS GUIDE

## COMMUNICATIONS

**Computer Mates** have a plug-in communications cartridge combining both word processing and database facilities for £149.

It can be controlled using a joystick and users can access any electronic or viewdata service.

Using a modem and an RS232C card, **Kuma**'s communications software costing £19.95 can be used to access electronic mail and viewdata services.

## 80 COLUMN CARD

The 40 column display generated by some of the MSX's can be increased to 80 columns with an 80 column card. One advantage of this is that the CP/M packages can be used.

**Spectravideo**'s 80 column video cartridge, the SVI-727 costs £112.79. The accompanying video cable slots into the cartridge and the monitor.

## INTERFACE BOARDS

**JVC**'s RS232C interface board, the IF7610 should be available by April and will cost £89.

ROM software with extended BASIC commands has been built into the board for communication purposes. A built-in terminal emulator can be accessed with BASIC commands. It acts as a printer port.

**Juma**'s RS232C interface board costs £99.50.

It provides independent transmit and receive channels including all standard hand shaking signals and will connect to printers.

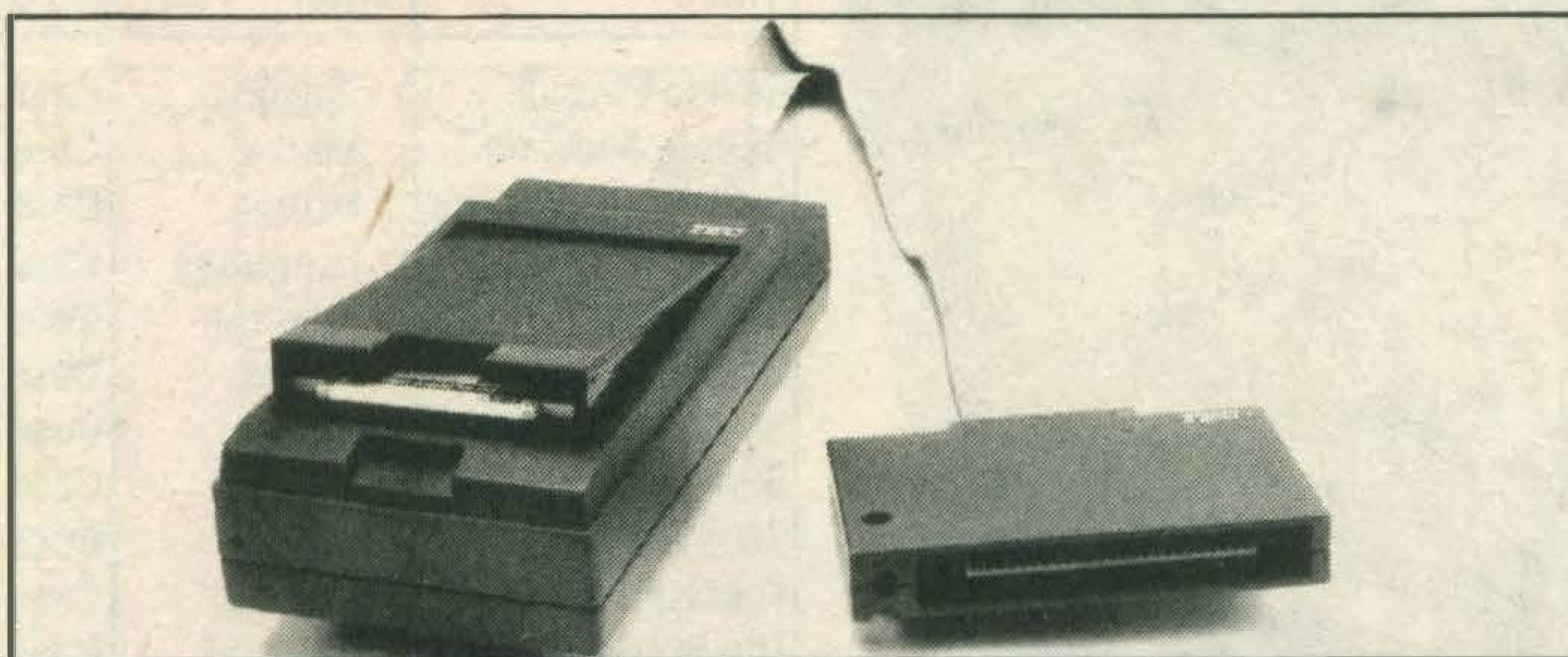
**Kuma** also has a parallel interface board for £59.50 which plugs into the cartridge slot. Options provided are a 3×8 bit port with full handshakes, a bit set and reset and a 1×8 bit bi-directional port.

**MSX-NET**'s programmable RS232C interface fits into the cartridge slot and costs £50. It will connect to modems, printers and robots.

## GRAPHICS TABLETS

Also known as digitisers, these together with relevant software enables user to design graphics, play games or even program.

The Graph Pad from **British Micro** comes with a graphics package and costs £125. The A4 pad can be used to design



**Tiny Disk Drive MP100 costs around £40 and uses 2.5in disks**

and store pictures using the Graphpad pen.

**Touchmaster** are hoping to launch a touch sensitive pad together with a graphics package for £149.95 together with an MSX interface for £16 by the end of Spring.

They have educational and games software planned, but will wait to see where the demand lies before developing them.

## LIGHTPEN

A lightpen is essentially a pen with a light detector positioned at the tip.

As yet **Sanyo** is the only MSX company to have produced a lightpen — the MLP001 costing £89.95.

The pen is attached to a cartridge which plugs into the computers cartridge port. A graphics package utilising a 15 colour palette is available with the pen.

## MUSICAL

**JVC**'s keyboard, the KV600 costs £629.

Preprogrammed sounds include 14 basic stereo rhythms, 16 percussion instruments and has a melody memory of up to 300 notes.

The keyboard covers four octaves and has built-in stereo speakers, although the board can be connected to amplifiers. It will also attach to a guitar strumboard (a stringless instrument) costing £40.

The KV600 will operate independently as a music synthesizer, but attaches to any MSX via a MIDI interface.

**Yamaha**'s keyboard, the DX7, otherwise known as a digital programmable algorithm synthesizer retails at £1,449.

Features include six sine wave operators, six envelopes, 16-polyphonic notes, 23 programmable performance and 145 voice parameters. Two plug-in cartridges contain 64 preprogrammed voices each are available as accessories.

The DX7 will attach to any synthesizer or MSX computer with a MIDI interface.

MIDI, an acronym for Musical Instrument Digital Interface, is the standard interface for transmitting data from one electronic music instrument to either another one or to a computer system.

**JVC** are currently developing a MIDI for the MSX, but no details are available yet.

## SPEECH SYNTHESIZERS

Strange robotic speech can be created with speech synthesizers and most use the allophone system.

**Kuma**'s package costs £69.50 and consists of cassette based software and a card which plugs into the cartridge slot. It uses 64 allophones.

Speakeasy from **Aztec Software** utilises 64 allophones and costs £29.95. It is a separate unit and connects to the MSX via the printer port.

## ADDRESSES

Aztec Software: (0924) 492826
British Micro: (0923) 48222
Cambridge Micro Computer Centre: (0223) 355404
Computer Mates: (0265) 810824
Doug Packer: 01-941 2560
JVC: 01-450 3282
Kuma Computers: (07357) 4335
Microlink: (0730) 895296
Micro Peripherals: (0256) 473232
MSX-Net: 01-788 3583
Sanyo Marubeni: (0923) 46363
Sony: (81) 61688
Spectravideo: 01-330 0101
Touchmaster: (0656) 744770
Yamaha-Kemble: (0908) 71771

## STORAGE DEVICES

Disk drives run and store files on floppy disks.

**Microlink** are distributing the Quick disk drive for about £130.

It holds 128K bytes of unformatted memory and uses double-sided double density 2.8 inch disks.

**Sony**'s disk drive, the HBD-50 has 500K bytes of unformatted memory and costs £349.95.

It uses 3.5 inch floppy single-sided double density disks.

**JVC** are planning to produce a disk drive with 500K bytes of unformatted memory. It will use single-sided double density disks. A 5.5 inch disk version is also planned.

The SV1-707, **Spectravideo**'s disk drive provides 500K bytes of unformatted memory and uses 5.25 inch double-sided double density disks. It retails at £345.

**Sony**'s battery-powered C/MOS RAM 4K data cartridge costing £39.95 offers an extra 4K of memory. **Yamaha** have a data cartridge too, at £65 for 4K storage.

The Tiny Disk Drive MP100 is available from the **Cambridge Micro Computer Centre** and costs about £40. It uses 2.5 inch disks.

## MEMORY EXPANSION

By adding extra RAM to an MSX, more programs can be compiled. With a full 64K of RAM, some of the more sophisticated CP/M programs can be run.

**Spectravideo**'s 64K RAM cartridge, the SV1-747 provides an additional 32K of memory for £100.

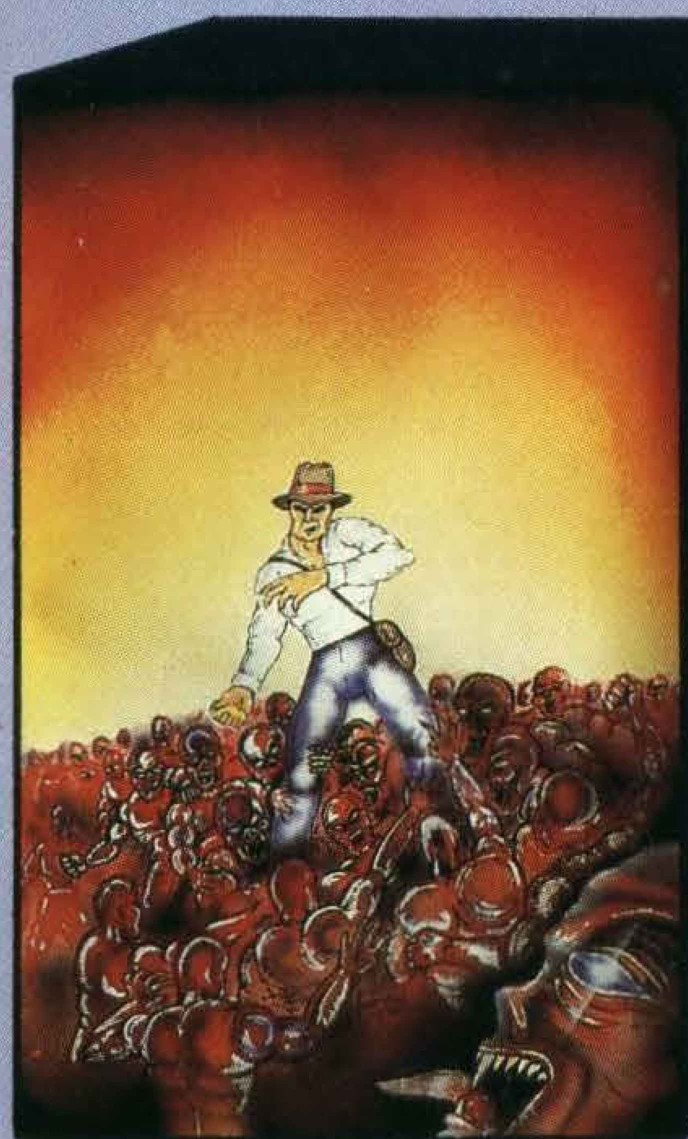
## PRINTER CABLES

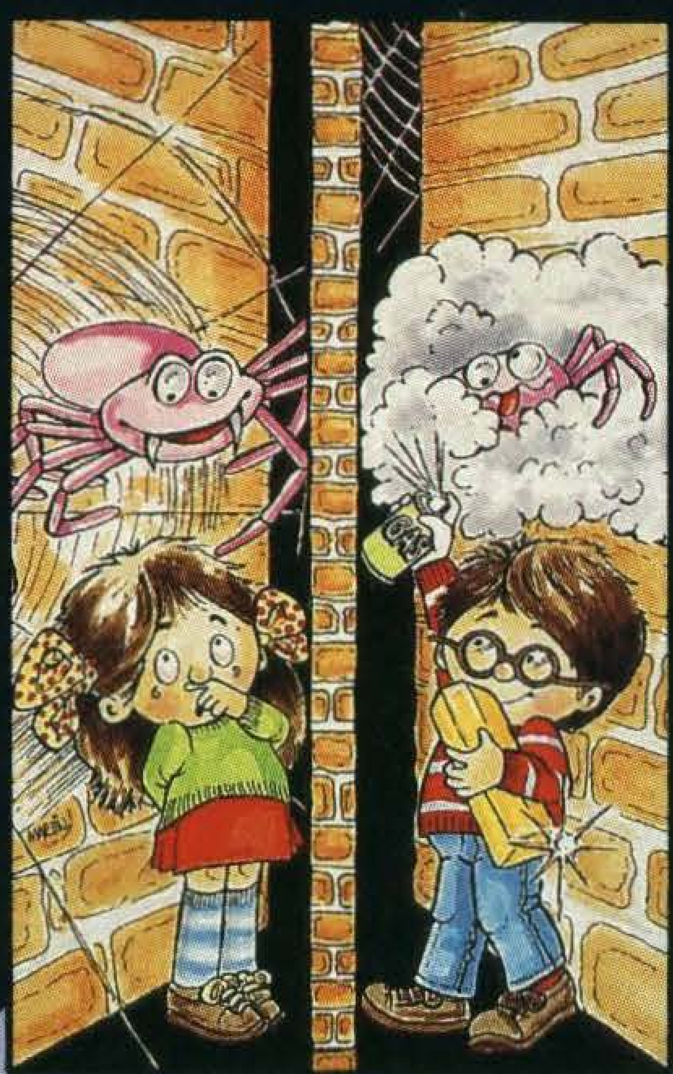
To connect an MSX to a parallel Centronics printer, you need a printer cable with a 15-pin amphenol (MSX printer socket) to 36-pin amphenol (standard Centronics printer connection). **Micro Peripherals** are selling the 1.5 metre Canon MSX Parallel printer cable for £13.50.

**Aztec's Software** MSX printer cable costs £14.30. **Doug Packer**'s cable retails at £15, **Spectravideo**'s 1.5 metre cable costs £15.95 and **Boots The Chemist** are selling a 1 metre cable for £9.95.

the only choice

# Kuma MSX

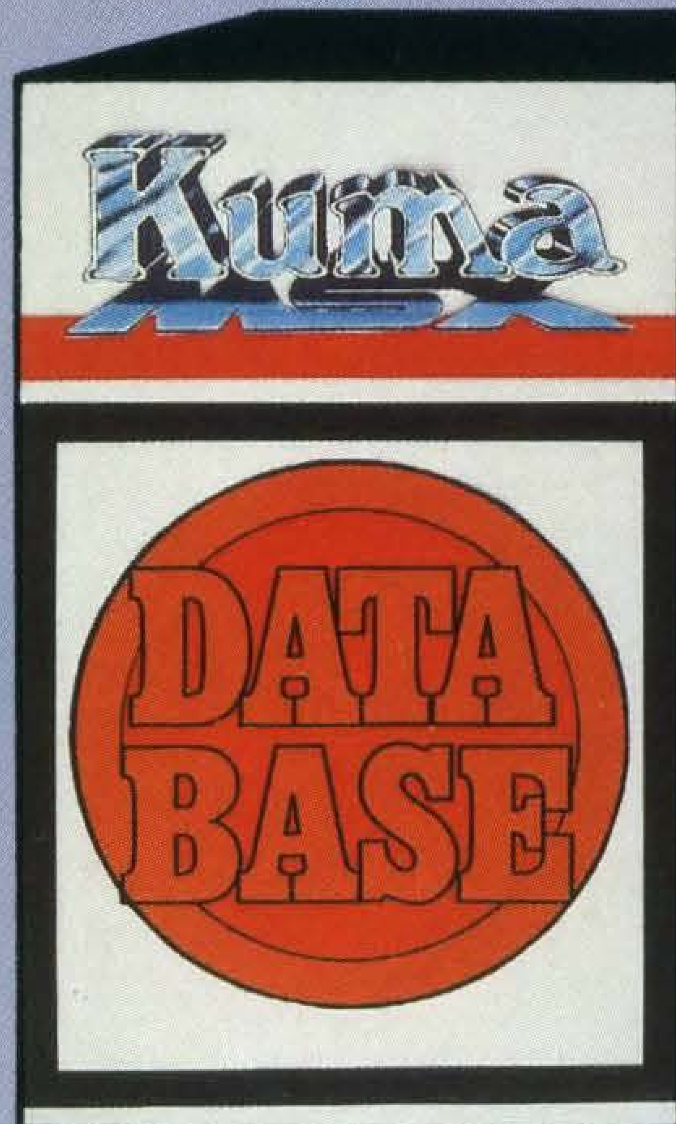

Eric and the Floaters


Binary Land

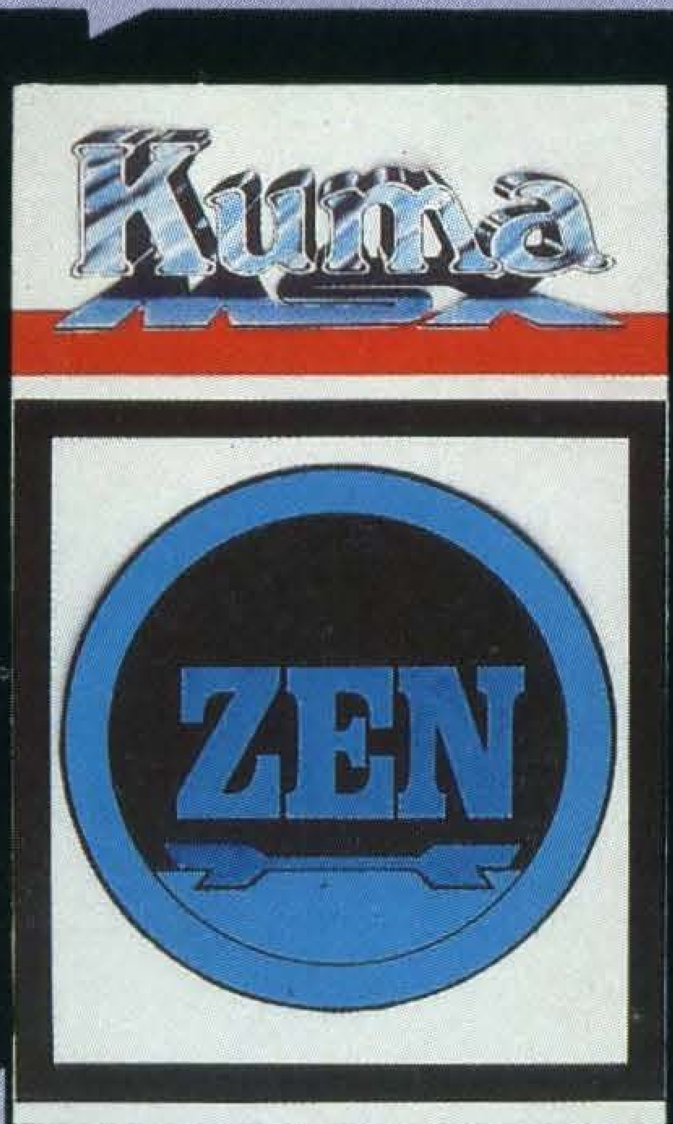

Driller Tank


Fire Rescue


Hyper Viper



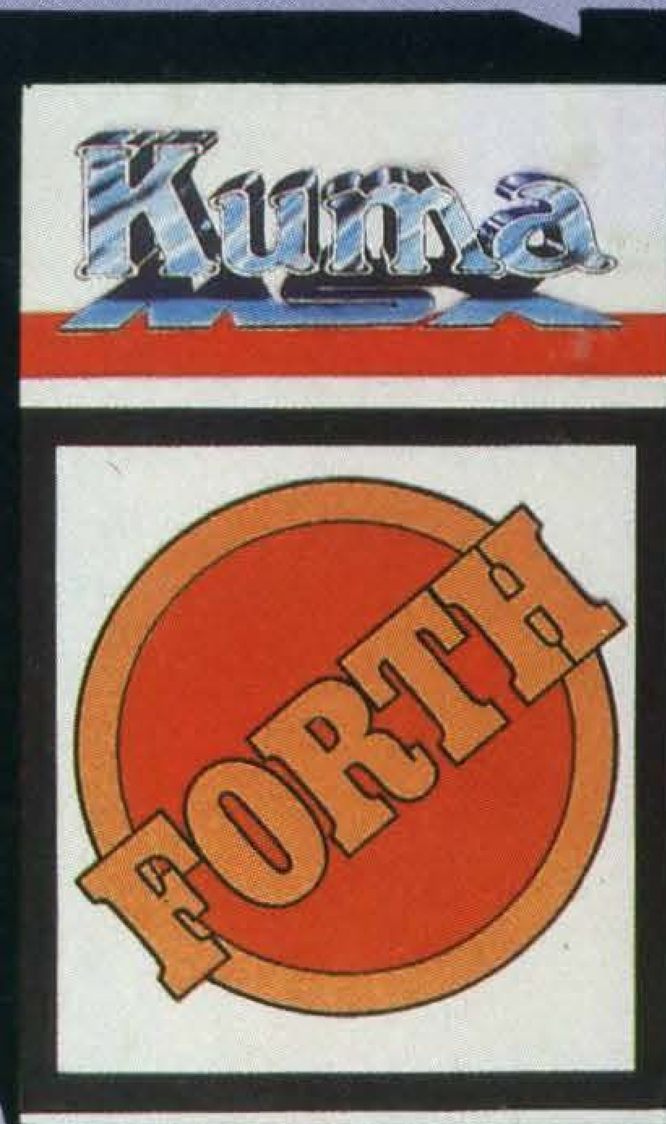
Database



ZEN Assembler



WDPRO



Kuma FORTH



Home Budget

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*ACCESSORIES ● **RS232C Interface** ● **Speech Synthesiser** ● **Parallel Interface.***

**NEW TITLES ● **Star Avenger** ● **Superchess** ● **Stop the Express** ● **Ninja** ● **Mean Streets** ● **Logo Turtle-graphics.***

***Now available from larger branches of Boots and selected branches of Co-op, Granada, LASKYS and John Menzies***

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